Pest Animal Management Plan 2025-2030



Executive Summary

Byron Shire Council has developed this Pest Animal Management Plan to outline the management of pest animals on Council-owned and managed land within the Byron Shire local government area, located in the North Coast region of New South Wales. Reducing the biosecurity risk associated with pest animals on Council-owned and managed land is Byron Shire Council's 'General Biosecurity Duty'. Along with the North Coast Regional Strategic Pest Animal Management Plan 2024-2029, this Plan can also be used as a guide for other stakeholders involved in pest management within the Shire.

The Plan focuses on priority pest animals within the Shire and categorises them into established and emerging species.

Established species include:

- European red foxes (Vulpes vulpes)
- feral cats (Felis catus)
- wild dogs/dingoes (Canis familiaris)
- European rabbits (Oryctolagus cuniculus)
- European brown hare (*Lepus europaeus*)
- Indian myna (Acridotheres tristis)
- cane toads (*Rhinella marina*).

Emerging species include:

- feral pigs (Sus scrofa)
- feral goats (Capra hircus)
- feral deer (various species).

Alert species are new incursion species that are usually restricted to specific areas and require immediate response. This group includes the red-eared slider turtle (*Trachemys scripta elegans*), American corn snake (*Pantherophis guttatus*), Indian ring-necked parrot (*Psittacula krameri*) red imported fire ant (*Solenopsis invicta*), and yellow crazy ant (*Anoplolepis gracilipes*). These species and their management are the primary responsibility of leading pest agencies Department of Primary Industries and Regional Development and Local Land Services and are therefore not the focus of this Plan. Council recognises the impact these species can cause, therefore information about these species is presented in this Plan. Council will continue to work with leading agencies and follow their advice in responses to incursions of alert species.

The Plan is based on various legislative requirements, Commonwealth, State and regional strategies and plans, recent research, local data, local impacts and priorities identified through local stakeholder engagement, including input from First Nations Peoples. Council's primary objectives are to carry out its General Biosecurity Duty to minimise risks associated with pest animals, emphasising humane and safe management approaches that are effective at reducing risk whilst protecting the environment, people and industries within the Shire. The Plan identifies strategies and actions required for pest management, including support for research and development of improved pest management approaches. The Plan includes strategies that balance risk-based management of wild dogs with the conservation of dingoes, which are culturally significant to First Nations peoples and play a vital role in

ecosystem services.

This is an update from the 2018-2023 Plan and will provide guidance for Council's pest management between 2025-2030. The Plan will act in conjunction with the Byron Shire Council Integrated Pest Management Strategy 2019-2029 and the North Coast Regional Strategic Pest Animal Management Plan 2024-2029.

Acknowledgements

Byron Shire Council acknowledges Traditional Aboriginal Custodians and recognises the continuing connection to lands, waters and country. We recognise and respect the Bundjalung of Byron Bay – Arakwal and the Widjabul Wia-bal Peoples native title rights and interests within the Shire and pay respects to their Elders past and present. Byron Shire Council also acknowledges the Tweed Byron, Jali and Ngulingah Local Aboriginal Land Councils under the *Aboriginal Land Rights Act NSW 1983*.

Council would also like to acknowledge the First Nations people who generously contributed to the development of the Plan.

Acronyms and abbreviations

1080	Sodium fluoroacetate 1080 poison bait
ABARES	Australian Bureau of Agricultural and Resource Economics and Science
BAU	Business as usual
BC Act	Biodiversity Conservation Act 2016 (NSW)
Biosecurity Act	Biosecurity Act 2015 (NSW)
Council	Byron Shire Council
DCCEEW	Department of Climate Change, Energy the Environment and Water (NSW)
DNA	Deoxyribonucleic acid
DPIRD	Department of Primary Industries and Regional Development (NSW)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
GBD	General Biosecurity Duty
GPS	Global Positioning System
IPA	Indigenous protected area
IPM	Integrated Pest Management
KPI	Key performance indicators
LALC	Local Aboriginal Land Council
LGA	Local Government Area
LLS	Local Land Services
LLS Act	Local Land Services Act 2013 (NSW)
MERI	Monitoring, evaluation, reporting and improvement
NCLLS	North Coast Local Land Services
NCPTWG	North Coast Pest Technical Working Group
NPWS	National Parks and Wildlife Services (NSW)
NSW	New South Wales
PAMP	Pest Animal Management Plan
the Plan	Byron Shire Council Pest Animal Management Plan 2025-2030
QPWS	Queensland Parks and Wildlife Service
RNTBCs	Registered Native Title Bodies Corporate
RSPAMP	Regional Strategic Pest Animal Management Plan
SA	Strategic action
the Shire	Byron Shire
SMART	Specific, measurable, achievable, relevant and time-bound
UNSW	University of New South Wales
WWF	World Wildlife Fund

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1 Introduction

An invasive species is a plant, animal, or organism in a place it does not naturally occur, often because of human activities, and causes harm to the environment, economy, or local wildlife. These species often take over by feeding on (predating) or competing with native species for resources like food, space, or water. Pest animals are defined by the impact (damage) it causes to community or environment rather by its natural occurrence. Pest animals also impact associated Aboriginal cultural values (e.g. totems) and may have impacts at cultural heritage sites.

A pest species is a plant or animal that causes harm to the environment, economy, or local wildlife.

Priority pest species covered in this Plan includes foxes, feral cats, wild dogs/dingoes, rabbits, hares, Indian myna, cane toads and emerging species such as feral pigs, feral goats and feral deer.

Effective management of pest animals requires a clear and strong commitment and collaboration between stakeholders including all levels of government, First Nations Peoples, and the community. The cost to manage pest animals is significant and growing annually (Brink et al. 2019, Hafi et al. 2023). The most cost-effective method of managing pest animals is to prevent incursions before pests become widespread (NCLLS 2024).

The New South Wales (NSW) *Biosecurity Act 2015* (Biosecurity Act) together with the *Local Land Services Act 2013* (LLS Act) recognizes that all landowners and managers have the same responsibilities to manage biosecurity risks associated with pest animals on their lands, including both private and public land. This is referred to as their General Biosecurity Duty (GBD).

This Pest Animal Management Plan (the Plan) will guide Byron Shire Council (Council) to meet its statutory requirements and reduce impacts caused by pest animals to cultural, economic, environmental, and social values. This will be achieved by controlling pest animals in Council owned and managed land and work with North Coast Local Land Services (NCLLS) supporting landholders when resources allow. The Plan acknowledges the responsibilities of Byron Council and various stakeholders, including Commonwealth and State governments and the wider community. Byron Shire (the Shire) sits within the North Coast region of New South Wales (NSW), and established and emerging pest animal management within this region is overseen by NCLLS. This Plan is based on the NCLLS Regional Strategic Pest Animal Management Plan (draft; RSPAMP 2024). A history of pest impacts and management in Byron Shire is summarised in Appendix 1.

Climate change is expected to exacerbate impacts of pest animals, especially while native species are already facing other challenges. Some pest species might benefit from climate change. For example, in the event of bushfires, feral cat and European red fox ("fox") predation on native animals can increase due to the reduction in cover for native species (Gill et al. 1999). In addition, recently fire ants were recorded forming rafts and travelling on flood waters, helping them spread their range (Honan & Fernandez 2024).

It is important to consider that Commonwealth and State legislation currently refer collectively to wild dogs as all free-ranging dogs, including dingoes, feral dogs and their

hybrids. New research indicates a higher proportion of dingo DNA exists in free-ranging dogs than previously thought, with over 75% of dogs having a higher proportion of dingo DNA than domestic dog DNA (Cairns et al. 2023; see Appendix 2 for further detail). Furthermore, dingoes (locally known as Ngugum/Ngagam) are deeply spiritual to First Nations peoples, to the degree that they are referred to as kin (see Appendix 2 and Appendix 3). Based on these research findings and the First Nations Dingo Declaration (Appendix 4), there has been an increase in local, regional and national prioritisation of dingo conservation efforts. Byron Council recognises the cultural value of dingoes, and their ecological role, and acknowledges the community feedback that indicates a desire to conserve dingoes in the Shire while minimising risk to the broader community. The Plan takes a risk-based approach to the management of dingoes with a preference for non-lethal management, where this will satisfy Council's General Biosecurity Duty (GBD). In acknowledging that dingoes are a valuable native species but can also prove a biosecurity risk, free-ranging canids will be referred to collectively as wild dogs/dingoes unless specifically referring to either wild dogs (including hybrids with low dingo genetic purity) or dingoes (including hybrids with high genetic purity).

1.1 Purpose

The Plan has been developed to:

- ensure Council meets its statutory obligations and complies with relevant legislation
- establish a clear and transparent framework outlining Council's role, proposed actions and the process of collaborating with other government agencies
- clarify how Council can provide community support on pest issues.

The Plan aligns with various legislation and policy, including the NSW *Biosecurity Act 2015* (Biosecurity Act), NSW *Local Land Services Act 2013* (LLS Act) and the NCLLS Regional Strategic Pest Animal Management Plan (RSPAMP) 2024-29 (NCLLS 2024) and follows their guidance in defining priority species. Please note that NCLLS is the primary government agency responsible for pest animal management (established and emerging species). The role of Council, like that of any other landowner, is to control pests on its own land, thereby minimizing or eliminating risks to neighbouring properties.

Council's vision is to foster a collaborative, cross-tenure approach to pest animal management to reduce the impacts of pest animals on cultural, economic, environmental, and social values in Byron Shire.

1.2 Scope

Under the Biosecurity Act all land managers have a General Biosecurity Duty (GBD) to prevent, minimise or eliminate all biosecurity risks. The GBD is a principle that can be used by land managers to encourage best practice behaviours for effective pest animal management.

This Plan applies to Council-owned and managed land within the Shire. It can also be used to support pest management on land controlled by State Government agencies and private land managers as a guide to fulfill their GBD on their lands.

There are three categories of pest species:

- Established species pest species that have already become established in the Byron Shire.
- Emerging species pest species that are established in nearby areas but not yet in Byron Shire, so there is a risk that they could become established in the Byron Shire.
- Alert species species where efforts are required to prevent their incursion into Byron Shire. These are the species which Department of Primary Industries and Regional Development (DPIRD; NSW Government) identifies as biosecurity risks on a regional level. Alert Species for Byron Shire are identified at the time the Plan was prepared, acknowledging they can change over time. Landowners must always consult DPIRD to get the most up to date list of Alert Species.

The Plan prioritises:

- 1. Preventing the incursion of new species, including alert and emerging species.
- 2. Eradicating localised populations of pest species.
- 3. Preventing the spread and reducing the impacts of established species.

Pest animals addressed within this Plan are shown in Table 1. These are based on known impacts within the Shire, community feedback received in developing the Plan, and the priority species identified in the NCLLS RSPAMP (NCLLS 2024).

Table 1 Pest species in the Shire that are the focus of the Plan

Pest species	Distribution in North Coast region	Status in the Shire	Management approach	
Cane toad (Rhinella marina)	Widespread and	Target	Asset based	
Indian myna (<i>Acridotheres tristis</i>)	abundant	species	protection	
European rabbit (rabbit; <i>Oryctolagus cuniculus</i>)				
European red fox (<i>Vulpes vulpes</i>)				
Feral cat (Felis catus)				
Wild dog / dingo (<i>Canis</i> familiaris)				
European brown hare (hare; <i>Lepus europaeus</i>	Widespread			
Feral pig (Sus scrofa)	Small, localised	Emerging	Eradication /	
Feral deer (various species)	populations in region: probably	species	prevention	
Feral goat (<i>Capra hircus</i>)	absent in Byron Shire but poses imminent threat			
Alert species (various species)	Species absent / small number of localised populations	Alert species	Prevention	

Not included in the scope of the Plan are invasive plants, freshwater or marine pests, invertebrates (other than alert species), domestic or public health pests (e.g. rodents, mosquitoes, and cockroaches), or pathogens of humans, domestic animals and livestock. Also, alert species are mentioned to increase awareness, but their management is not within the scope of this Plan.

Native animals, other than dingoes, are protected and managed separately in accordance with the NSW *National Parks and Wildlife Act 1974* and *Biodiversity Conservation Act 2016*.

1.3 Objectives and desired outcomes

Council will aim to achieve the desired outcomes and objectives below. Actions to achieve these objectives are detailed in Sections 7 and 8.

Council's objective is to improve pest animal management in Byron Shire through collaborative, evidence and data-based pest animal management that reduces biosecurity risk across Council-managed lands.

Desired outcome 1: Negative impacts of pest animals are reduced, with Council meeting its responsibility to manage pest animals on Council-managed land.

 Objective 1.1 Proactively manage pest animals according to Council's GBD to reduce biosecurity risk via a prioritised strategy of prevention, eradication, containment or assetbased protection for priority pest animal species on Council-owned and managed land.

Desired outcome 2: Coordination of pest animal management is strengthened by collaboration across the Shire and the region.

- Objective 2.1 Foster collaborative and coordinated pest animal management with integrated activities by Council, First Nations people and community across the Shire, including engagement with regional land managers for strategic management of emerging pest species.
- Objective 2.2 Increase community understanding and engagement regarding pest animal management in the Shire, including benefits and best practice.

Desired outcome 3: Pest animal management is evidence-driven by supporting collaborative research initiatives

• Objective 3.1 Support pest management research and incorporate First Nations Cultural Knowledge and contemporary findings into Council's pest management program.

1.4 Commencement and duration

The Plan comes into effect once formally adopted by resolution of Council and will remain in place for five years to 2030.

1.5 Plan structure

The overall structure of the Plan is presented in Figure 1.



Figure 1 Structure of the Plan

2 Planning context

Pest management in Australia occurs at three levels of government. A summary of key pest animal legislation, strategies and plans for vertebrate pests are provided below and in Figure 2.



Figure 2 The NSW Biosecurity framework for invasive species in NSW (adapted from the NSW Invasive Species Plan 2023-2028).

2.1 Legislation

Pest management actions implemented by Council must comply with relevant legislation and animal welfare requirements. A detailed summary of relevant legislation is provided in Appendix 5.

To comply with the legislation, all landowners and managers - whether public or private -must fulfill the General Biosecurity Duty.

This means that Council, like other landowners and managers, is responsible for taking action to prevent and control risk associated with pest animals on the land they own or manage, minimizing negative impacts to the environment, agriculture, and public health.

Under the Biosecurity Act, Council, as any landowner/manager, has a legislative requirement to manage biosecurity risk associated with pest animals on Council owned and

managed land, eliminating or minimising the risk in neighbouring lands.

The Biosecurity Act repealed Part 10 of the LLS Act which covered the management of wild dogs/dingoes on Schedule 1 and Schedule 2 lands in NSW. It also repealed parts of the *Wild Dog Destruction Act 1921* and renamed it to the *Border Fence Maintenance Act 1921*. This changed the management of wild dogs/dingoes from a general destruction duty to a GBD, which means wild dogs/dingoes are now only required to be killed if they are posing a biosecurity risk (DPI 2015). This repeal allows for dingo conservation to take place alongside the GBD of various stakeholders in NSW.

2.2 Relevant strategies and plans

Various strategies, plans and documents are relevant to pest animal management in the Shire. Summaries of relevant strategies and plans are in Appendix 5.

2.2.1 Commonwealth / national

The following national strategies, policies and plans have been considered when developing the Plan.

- Australian Pest Animal Strategy 2017-2027
- National Wild Dog Action Plan 2020-2030.
- National First Nations' Dingo Declaration 2023.

2.2.2 State

The following State policies and plans have been considered when developing the Plan.

- NSW Wild Dog Management Strategy 2022-2027
- NSW Biosecurity Strategy 2013-2021
- NSW Biosecurity and Food Safety Strategy 2022-2030
- NSW Invasive Species Plan 2023-2028.

2.2.3 Regional and local

The following regional and local policies and plans have been considered when developing the Plan.

- NCLLS Regional Strategic Pest Animal Management Plan 2024-2028
- Byron Shire Council Integrated Pest Management Policy 2024-2028
- Byron Shire Council Integrated Pest Management Strategy 2019-2029
- Byron Shire Council Biodiversity Conservation Strategy 2020-2030
- Byron Shire Rural Land Use Strategy 2017
- Byron Shire Council Dogs in Public Spaces Strategy 2022-2032
- Byron Shire Community Strategic Plan 2032
- Byron Shire Council Climate Change Adaptation Plan 2021-2026

• Byron Shire Council operational plans for pest species.

2.3 Stakeholders

Information from the consultation with various stakeholders has been incorporated into the development of the Plan. Details about relevant stakeholders involved in pest animal management in the Shire can be found in Appendix 6.

Stakeholders that are involved in pest animal management in the Shire include:

- Traditional Owners holding Native Title Rights and Interests, including Local Aboriginal Land Councils (LALCs) and those with rights to care for Country
- First Nations Peoples and representative Aboriginal organisations such as Local Aboriginal Lands Councils
- Australian Government
- Centre for Invasive Species Control
- National Wild Dog Action Plan Committee
- NSW Government
- Department of Primary Industries
- State Pest Animal Committee
- Local Land Services (LLS)
- NSW National Parks and Wildlife Service (NPWS)
- Forestry Corporation
- Crown Lands
- Byron Shire Council
- private landowners and community.

2.4 Roles and responsibilities

Roles and responsibilities are shared amongst various stakeholders including government, industry, community groups and individuals (Figure 3). Whether on private or public land, all land managers in NSW must comply with requirements outlined in the Biosecurity Act to manage biosecurity risk caused by pest species on land that they manage preventing, eliminating or minimising the risks on neighbouring land. Roles and responsibilities are outlined in Table 2.



Figure 3 Main stakeholders' role in pest management in NSW.

NSW DPIRD	PIRD North Coast Local Land Services Council		Private landowners / managers
 DPIRD is the lead agency for invasive species policy in NSW 	 Develop the RSPAMP and regional Operations Plans to guide local control programs 	 Report pest sightings, damage and control conducted to NCLLS 	 Report pest sightings, damage and control to NCLLS (rabbits, wild dogs/dingoes, feral pigs,
 Manage new terrestrial and aquatic invasive species incursions and manage established aquatic pests 	 Coordinate large-scale cross- tenure pest animal control programs and facilitate collaboration 	 Undertake pest management on owned and managed lands to minimise the biosecurity risk of pests 	feral goats, feral deer and cane toads; for foxes, mynas and cats this is recommended but is not a requirement;
 Develop policies and guidelines that support a consistent approach to 	 Promote best practice control and Integrated Pest Management programs 	 Promote best practice control and Integrated Pest Management programs 	 Undertake pest management on their lands to minimise the
 planning, operations and enforcement across the state Administer licensing systems for recreational hunting of certain game and pest animals and for the keeping of certain 	 Educate communities on GBD, the risks posed by pest species, management and control, mandatory measures and restrictions on pet sales Compliance of land managers' 	 Increase awareness of land managers' GBD, mandatory measures, restrictions on pet sales, and responsible pet ownership Promote greater land manager 	 biosecurity risk of pests Notify pest sightings, damage and control to LLS, including wild dog/dingo Rapid reporting of any alert species DPIRD
permitted non-indigenous animals	GBD, mandatory measures and restrictions on pet	participation in wild dog/dingo management	
 Run education and awareness programs including land manager obligations under the Biosecurity Act, best practice for pest management and alert species management, identification and reporting 	 ownership Distribute the vertebrate pesticide baits and provide associated training for land managers Consider whether eradication or containment should be 	 Investigate options for wild dog/dingo research and conservation innovations Rapid reporting of any alert species sightings to NCLLS and DPIRD Support community 	
improved monitoring and	attempted when established species are spreading into a new region, in collaboration	awareness about alert species, identification and reporting by sharing	

Table 2 Responsibilities of various stakeholders to fulfil their General Biosecurity Duty

NSW DPIRD	North Coast Local Land Services	Council	Private landowners / managers
 control techniques specifically for feral cats Provide an NSW cane toad management strategy to guide investment and effort by the NSW government and non- government organisations and report on outcomes and provide recommendations for modifications where necessary Increase awareness and community capacity to effectively manage cane 	 with North Coast Pest and Weed Advisory Committee with the support of the North Coast Pest Technical Working Group Promote greater land manager participation in pest management and assess the need for compliance programs Increase / improve reporting of stock losses to pests and pests sightings Assist landholders to control 	 information from LLS and DPIRD Assist primary stakeholders responsible for alert species (i.e. LLS and DPIRD) as needed 	
toads, minimise their impacts and prevent further spread across NSW	 feral pigs when needed Lead control programs for feral deer control 		
incursion response in the cane toad incursion management area	Assist landholders to undertake control of feral deer when needed		
 Manage new incursions of all vertebrate and invertebrate alert species 	 Initial response to incursions of alert species through consultations with DPIRD and the DCCEEW 		
Initial response to incursions of alert species through consultations with NCLLS and the DCCEEW	 Educate communities about alert species, identification and reporting 		

2.5 Development of the Plan

The process for the Plan's development and approval was as follows:

- 1. Project team established to provide advice on preparation of draft Plan.
- 2. Internal and external stakeholder analysis for preparation of desired outcomes and species prioritisation.
- 3. Stakeholder and Community Engagement Plan implemented.
- 4. Draft Plan developed and reviewed by Council.
- 5. Draft Plan provided to NCLLS and DPIRD for comment.
- 6. Draft Plan released for public exhibition.
- 7. Submissions reviewed and draft Plan amended to incorporate feedback.
- 8. Approved and adopted Plan implemented by Council.

2.5.1 Consultation

There are a range of stakeholders who are directly or indirectly affected by pest animals or who are impacted by pest animal management, all of whom were invited to share their thoughts and provide advice and input in the development of the Plan. Extensive effort was made to engage with the community and other stakeholders in development of the Plan. Engagement methods included, farmers market stalls, a workshop with First Nations stakeholders, email and social media engagements with private land managers and the broader community, as well as an online survey (results from community engagements are summarised in Appendix 3). Following internal reviews from Council and reviews from NCLLS, the draft Plan was published online and comments invited from the general public and relevant stakeholders.

A summary of community engagement activity relating to the Plan is as follows:

- 78 respondents completed an online survey which was available 24 July-26 August 2024
- 19 participants representing four groups (Arakwal, Madhima Gulgan Community Association, Minyumai rangers and Tweed Byron Local Aboriginal Land Council) attended the First Nations stakeholder workshop on 19 June 2024
- 50 people were engaged at a local farmers' market Council stall on 1-2 August 2024
- 2 Facebook and 2 Instagram posts (23 July and 20 August) reached 2,240 people and had 327 post engagements (reactions, comments, clicks and shares).
- 11 local farmers replied to the Farmers network engagement email.

3 Pest animal impacts

Pest animals have considerable cultural, economic, environmental, and social impacts. NSW legislation requires land managers to manage the biosecurity risk caused by pests on the land they manage to reduce impacts (Thompson et. al. 2013). Figure 4 provides a summary of the range of impacts selected pest animals have in Australia and includes those highlighted in stakeholder consultations and pest animal reports to Council.

Cultural	 Damaging cultural assets e.g. Country, totem animals and cultural sites Pest control damaging country e.g. baiting Pest control of culturally important dingoes Pest species compound negative associations with European invasion
Economic	 Direct impacts like livestock predation, damage to infrastructure and damage to grazing/horticulture/backyard gardens Indirect impacts like stress to livestock reducing productivity, and reduced tourism revenue Cost of pest management and control
Environmental	 Habitat destruction including soil, vegetation and water Direct predation of native wildlife Out-competing native wildlife for food and habitat Spreading diseases and weeds
Social	 Distress caused by impacts and risks, including to livestock, wildlife, horticulture/gardens, domestic pets and recreational areas Fear of attacks by pest animals Conflict between people about pests and pest management Spread of disease that can impact humans, livestock and domestic pets

Figure 4 Summary of impacts of priority pest species and pest control

3.1 Cultural

From a First Nations perspective, the impact of pest animals continues across Country including Bundjalung Country (this includes land that is referred to as Byron Shire). As well as damaging the natural environment, pest animals can impact on culturally significant species including totems (e.g. via predation) and degrade sites of cultural significance such as Aboriginal rock art sites, burial places, caves, middens and other historically significant structures (e.g. via rabbits burrowing; Taylor & Edwards 2005; Trigger 2008; Smith 2018).

Aboriginal spirituality is totemic. A totem is a natural object, plant or animal that is inherited or given by members of a clan or family as their spiritual emblem. Totems define peoples' roles and responsibilities, and their relationships with each other and creation. By being connected to totems and what they represent Aboriginal people, individually and collectively, share responsibility for each other and Country (Taylor & Edwards 2005). For example, the primary totems for the Bundjalung people are the three provenance species of goanna including coastal sand goanna (*Varanus gouldii*) and snakes (all species; Smith 2018). Whereas for the Arakwal people of Byron Bay the Miwing, (white-bellied sea eagle, *Haliaeetus leucogaster*), is the men's totem, and the clan totem is Kabul (coastal carpet python, *Morelia spilota mcdowelli*; Arakwal of Byron Bay 2018).

Some pest animals and their negative impacts are regarded by First Nations people as an additional burden caused by European invasion (Riley 2013). In addition, ongoing population control of wild dogs impacts culturally significant dingoes (Smith & Litchfield 2009). Dingoes are a highly important, culturally significant species for First Nations People and local Aboriginal communities want them conserved and protected. Like other First Nations groups such as the Butchulla (K'gari), Bundjalung People regard dingoes as kin as they are believed to protect Aboriginal Peoples from threats and evil spirits. Participants of the First Nations stakeholder workshop conveyed that they did not want baiting being conducted in the Shire due to the indiscriminate nature of baits and the risk associated with uptake of baits by non-target species, including totem animals (goannas and sea eagles) and dingoes (Appendix 3).

3.2 Economic

Economic impacts are traditionally quantitatively assessed. Economically, pest animal impacts include damage to infrastructure such as fences and watering points, predation on livestock, diminished livestock production due to either harassment of livestock or loss of primary productivity due to grazing pressure. The overall cost burden of pest animal control and damage mitigation (either at a local or wider scale) can also be considerable and in some cases outweigh the damage prevented. For example, the cost of wild dogs/dingoes management Australia-wide is estimated to be \$110 million per year, which saves an estimated \$76 million in livestock damage across Australia each year (Figure 5; Hafi et al. 2023).

Carnivorous pest animals cause economic losses associated with animals being killed or injured, as well as indirect impacts such as reduced breeding capacity of affected herds, dispersed flocks or herds, and reduced wool and meat yields due to stress. Some pest animals can have economic impacts on horticulture, for example, Indian mynas can cause serious damage to ripening fruit, such as grapes and blueberries (Centre for Invasive Species Solutions 2014). Rabbits cost approximately \$50 per rabbit per year in damages to irrigated pasture like lucerne hay, increasing to \$200 per rabbit per year for vegetable growers (Queensland Government 2008). Cost of rabbit damage to forestry plantations is approximately \$800 per hectare of the life of the plantation (PestSmart Invasive Animal Cooperative Research Council 2012). In addition, some pest animals such as wild dogs/dingoes and feral cats can transmit infectious diseases which lead to abortions in livestock, reducing productivity and leading to economic hardships. Some pests, such as cane toads, may impact tourism industries due to the propensity for high can toad numbers to congregate around campsites and public amenities.

Costs associated with management (baits, fences, trapping etc.) should also be considered. For example, the cost on management and research of feral cats has been estimated at \$2 million per year (PestSmart, Invasive Animal Cooperative Research Council 2011).



Figure 5 Estimated annual costs of wild dog/dingo management and damage prevented across Australia (Data source: Hafi et al. 2023)

3.3 Environmental

There are a range of negative environmental impacts caused by pest species. These include competition with or direct predation of native animals, displacement of natives from niche roles, overgrazing of native plants, soil degradation, loss of organic matter and soil structure leading to increased soil erosion, habitat destruction and fouling of waterways and degradation of water quality. There can also be secondary risks posed by some pest animals such as the spread of diseases (e.g. foot and mouth disease by feral pigs, feral deer and feral goats) and spreading of weeds.

Carnivorous pest animals (feral cats, foxes, wild dogs/dingoes and feral pigs) can predate on native species including threatened species e.g. koalas (Figure 6; Department of Transport and Main Roads 2017; Allen et al. 2016). Feral cats kill approximately 61 reptiles per km² per year, and an individual feral cat kills 225 reptiles per year (Woinarski et al. 2018). NSW's North Coast is a region with the highest frog, snake and marsupial diversity per unit area of land in Australia (Byron Shire Council 2024) and pest animal impacts could be significant to this biodiversity. This could lead to the localised extinction of some species (DEWHA 2008). In Byron Shire specifically, foxes are already known to predate on the eggs and chicks of threatened shorebirds. Native animals can also be harmed unintentionally from pest control activities such as baiting or trapping. Pest animals can also spread diseases and parasites to native animals (Fancourt et al. 2014).

Cane toads kill native species that usually predate on non-toxic amphibians, including threatened species such as spotted-tail quolls (*Dasyurus maculatus*). Via predation and also through outcompeting native amphibian species, cane toads could significantly affect the North Coast's high diversity of frogs, snakes and marsupials (Byron Shire Council 2024).

Pest animal's environmental impacts can also be indirect. They can compete with native species for food or cause displacement from traditional habitats. Indian mynas in Australia have been attributed to a decline in at least nine species of native birds (Hanson 2012). Byron Shire has a high diversity of bird species, with 300 different bird species being recorded in the Shire, 48 of which are threatened species (Byron Shire Council 2020). The presence of Indian mynas could have significant impacts on this biodiversity. Pest animals

are also carriers of weeds. For example, foxes are legitimate dispersers of weeds via seeds they consume and defecate. A seed takes 4 to 48 hours to pass through a fox's digestive system, allowing time for viable seeds to be distributed over wide distances. It is also likely that seeds are dispersed by attaching to fox fur (Agriculture Victoria 2024).

3.4 Social

Social impacts can best be defined as affecting mental health and interactions between individuals and groups. As such, social impacts include increased fear and apprehension of pest animal attacks (e.g. wild dogs/dingoes), distress associated with witnessing injury or death of pets, wildlife and livestock, distress at methods used to control pest animals (including distress caused to First Nations People when dingoes are impacted by control activities), stress associated with cultural loss, distress over loss of income or increased costs, social conflicts over responsibility for control, and community divisions over animal welfare issues.

The issues surrounding animal rights are becoming an increasing source of social contention, and sometimes arise when pest animal control activities are proposed. Pest animals can also carry diseases and parasites that are transmissible to domestic pets or humans such as sarcoptic mange, hydatids, distemper, and leptospirosis carried by wild dogs/dingoes; toxoplasmosis carried by feral cats and Indian mynas carrying avian influenza and salmonellosis, and parasites such as mites, which can cause dermatitis in humans (Centre for Invasive Species Solutions 2014).

Distress can be caused by disturbances caused by pest animals at night (e.g. feral cats caterwauling or urinating around buildings), pest animals harassing domestic animals, eating pet food, raiding rubbish bins, defecating or digging in gardens, and chewing infrastructure such as garden hoses and irrigation systems. People may also become distressed from the loss of native wildlife or finding the remains of wildlife killed by pest animals. Domestic pets are also in danger from eating cane toads, and this may cause distress to pet owners. Cane toads can also cause disturbances from blocking drains, fouling swimming pools, nighttime noise and their unattractive nature (especially in large numbers). Rabbits can cause disturbance through the building of their warrens in areas used for recreation (e.g. horse-riding areas or backyards) or at sensitive sites such as graveyards. Their warrens can also damage infrastructure, causing distress.



Figure 6 The impacts of foxes and cats on wildlife. (Source: Stobo-Wilson et al. 2022)

4 Principles of pest management

Pest animal management strategies are guided by the "invasion curve," which shows how advanced each species is in its invasion. This curve helps identify the resources needed and the actions that can be taken and highlights the cost-benefit of prevention and early management. There are four main phases from prevention (including quarantine) to 'asset-based protection' for established and widespread pests (Braysher 2017; Figure 7). These management principles are summarised below.



GENERALISED INVASION CURVE SHOWING ACTIONS APPROPRIATE TO EACH STAGE

Figure 7 Generalised invasion curve (Source: Victorian Government 2010)

Prevention

The invasion curve highlights the need for early prevention and removal of small invasions before they establish themselves. This is often easier and cheaper to do. For example, removal of occasional deer incursions in Byron Shire. Effective prevention relies on strong border protection, collaboration with neighbouring areas, good biosecurity practices, monitoring, and community awareness and reporting.

Eradication

No widespread introduced pest animal species has ever been completely eradicated from mainland Australia, however regional/local eradications have been successfully achieved in the past, for example, fire ants in Western Australia. These efforts contribute to slow the spread and prevent the need for ongoing control. By its very nature, eradication is potentially the most expensive and disruptive in the short term, but the most cost-effective strategy in the long term. However, because the requirements for eradication are rarely met except for pests detected early on during an incursion, most pests are here to stay. Therefore, management to remove or reduce the impacts of pests will be ongoing.

Containment

If the pest, having escaped biosecurity measures, becomes established, focus can be shifted to containment in regions of establishment to limit the impacts to only those areas, for example, with deer in the North Coast region. In many ways, this is similar to the initial strategy of prevention on a smaller scale with the aim of preventing it spreading into non-infected areas. Sometimes a strategy of initial containment can be part of a longer-term eradication strategy.

Asset based protection

Once a pest has become established and widespread, investment should be wound back to target the protection of high-value assets, whether they are cultural, environmental, economic, or social. Often, the impacts of the established pest are such that investment must be continuous to protect assets (Braysher 2017). Cost-benefit analyses is also useful, particularly when looking at economic asset protection.

An example of asset protection is targeted European fox control to protect threatened shorebirds, a cost which can be shared with programs such as the NSW State-funded Saving Our Species program. This can be highly effective, for example the fledgling rate of the endangered little tern (*Sternula albifrons*) was 36% higher in areas with fox control compared to sites without (OEH 2016).

The most cost-effective way to manage pest animals is to prevent pest spread before they become widespread and established.

4.1 Supplementary management principles

The following principles can be useful to consider when considering the best approach to pest management.

4.1.1 Best practice

Best practice management integrates the best techniques adapted and improved over time that are proven to have the best outcomes in terms of mitigating impacts. Factors that go into making up best practice include the availability of multiple evidence-based management approaches, animal welfare concerns, timing of actions, and inter-species interactions.

The NSW Government provides standard operating procedures (SOPs) for the effective and humane management of pest animals. These SOPs are available for most recommended lethal control options that are most appropriate for individual species. SOPs for various pest species can be found at https://www.dpi.nsw.gov.au/biosecurity/vertebrate-pests/publications/standard-operating-procedures. Notably, some species, especially those best managed through shooting (e.g., deer), present challenges in urban areas.

Incorporating non-lethal methods into pest management is often suitable at a local level, such as for private landowners or managers. Non-lethal techniques, including netting, exclusion fencing, livestock husbandry practices, and livestock guarding animals, can help protect assets locally and provide long-term benefits by preventing pest-related damage. These methods can be used alongside lethal control measures to minimise asset damage and prevent local population increases (Appendix 7).

The 2018 community survey indicated that the use of 1080 poison is the least preferred management option in the study area due to concerns about risks to native wildlife and domestic animals. Similarly, the 2024 online survey showed that 54% of respondents opposed the use of 1080, and 45% were against baiting with other types of baits (e.g. PAPP). Indigenous stakeholders in the Shire also strongly advocated for discontinuing 1080 use due to its harmful effects on Country (refer to Appendix 3). In contrast, the most preferred pest control options in 2018 were trapping, shooting, and exclusion fencing. The 2024 survey indicates a shift towards non-lethal management, with 30 respondents incorporating some form of non-lethal control on their properties.

In alignment of Council's Integrated Pest Management (IPM) Policy (see Appendix 5), ground or aerial baiting with 1080 and den / warren fumigation are not considered best practice in the context of the Shire and will not be undertaken by Council staff or Council-engaged operators.

4.1.2 Nil tenure

Pest animals do not recognise land boundaries. They have home ranges and are likely to occur across multiple land tenures. For example, fox territories range from 2 to 5 km² and vary with type of habitat, population density of foxes and the availability of food. An effective management strategy is a shared responsibility between all land managers, regardless of whether on private or public land, as all land managers have the same responsibilities to manage the biosecurity risk of pest animals.

4.1.3 Coordination

A coordinated approach ensures that assets are protected across multiple land tenures and individual pests posing a biosecurity risk do not seek refuge on unmanaged land. Additionally, it is important to ensure that coordination considers inter-species interactions and risk-based approaches i.e. assessing whether controlling one species cause another species to increase its impacts, e.g. local rabbit control increasing fox predation on native species. Coordination is particularly important with emerging and alert species so that eradication and containment can be effectively achieved across boundaries.

Focus on the impact

It is important not to lose sight of the problem. The reason pest animals are managed is to reduce impacts. Managing pest animals with no resultant reduction in impacts is not a wise allocation of limited resources and raises an ethical question as to the value of culling. Monitoring of impacts should be a key element of any pest animal management program.

4.2 Monitoring and Reporting

Monitoring the impact of pest management is a crucial part of management but requires a lot of time, financial resources and effort, so it is important to determine the monitoring objectives: what information needs to be collected and why, when, where and how data will be collected and stored. Importantly, it should be clear how monitoring data demonstrates the achievement of desired management outcomes. Monitoring of local or regional established pests is done by the established pest leading agencies - DPIRD and LLS.

Reporting pests is another crucial step for early detection and effective management,

helping to prevent outbreaks, ecosystems and consequently us all. It also enables better resource allocation and raises public awareness about pest threats, ultimately minimizing economic impact. Besides informing NCLLS, Council has adopted and recommends the use of FeralScan: a secure method for collection and sharing of pest animal sightings, distribution, impact and control information. This is now embedded in contracts with pest control subcontractors and on pest control reporting sheets. Council is improving reporting protocols to ensure staff and contractors are aware of their responsibilities in reporting. While regional monitoring is DPIRD and LLS role, reporting is everyone's business.

FeralScan (www.feralscan.org.au) is a national free online resource that allows anyone to record pest animal activity, evidence of pests, pest damage and control actions (Figure 8). Data entered into FeralScan is used to help coordinate resources to address the problems pest animals are causing in a local area. FeralScan can be used anybody in the community and by local groups managing pest animals and their impacts and assists with planning and implementing a control program. It is also used to map rabbits, wild dogs/dingoes, foxes, feral cats, feral pigs, feral fish, feral camels, Indian myna, cane toads, feral goats, starlings, and feral deer.

FeralScan is a secure resource available to report and store information. It is quick and easy to use, and your records are private and confidential. This supports better planning and strategic allocation of resources. If advice and further immediate support is needed, Local Land Services should be contacted directly.



Figure 8 FeralScan is an online resource to assist in reporting and monitoring pest animal data

4.3 Responsible pet ownership

Although domestic pets are not covered in the scope of the Plan, responsible pet ownership plays an important role in reducing the risk of domestic pets becoming feral and contributing to the pest populations of the Shire. Approximately 10,000 pet dogs and 4,600 pet cats are registered in Byron Shire (Byron Shire Council 2022). Free-roaming, abandoned or lost pets (especially dogs [including working dogs], cats and rabbits) can cause increases in feral pest species and can result in increased negative cultural, environmental, economic, and social

impacts.

Impacts that roaming and abandoned pets have in Byron Shire include:

- Predation: Cats and dogs can hunt native wildlife, leading to declines in populations of small mammals, birds, reptiles. This predation pressure can disrupt local ecosystems and disrupt behaviours of native wildlife.
- Competition: Pets may compete with native species for food and habitat, which can be especially detrimental to vulnerable species.
- Disease transmission: Pets can introduce diseases to farming and wild animal populations.
- Habitat disturbance: Pets, can cause disturbances in natural habitats, leading to soil erosion and changes in vegetation structure.
- Invasive species: Some pets, if they are abandoned or breed with feral animals, can contribute to the number of pest animals, further increasing impacts.
- Broader community: Roaming or abandoned pets can pose significant risks to the community, including the potential to harm or kill livestock through fear or injury, diseases transmission and potentially attacking or frightening residents.

Ways in which residents of the Shire can be responsible pet owners includes:

- · keeping your pet on a leash where it's required to
- sterilising (spaying / neutering) their pets
- confining pets to their property and discouraging wandering
- microchipping and registering dogs and cats to help with traceability.

If residents are unable to continue caring for their pets, they should surrender them to Council or a local animal shelter rather than abandoning them. This will help ensure the welfare of pets and reduce the negative impacts of feral animals in the Shire.

Increasing awareness-raising materials and activities around responsible pet ownership within the Shire, improving access to vaccination and sterilisation services and implementing and enforcing penalties for irresponsible pet ownership are ways in which Council is reducing the risk of abandoned pets becoming pest animals in the Shire. Residents of the Shire should also familiarise themselves with the Council's Dogs in Public Spaces Strategy for guidance as to how best to manage pet dogs in the Shire (Byron Shire Council 2022).

Roaming pet animals was a significant issue raised by respondents to the online survey (see Appendix 3), and although the high sterilisation rate of respondent's pets indicated only a minor risk of domestic pets breeding with feral pest animals, the reported problem of roaming pets still presents a significant problem in the Shire, but one that is outside the scope of the Plan.

4.4 Planning

The Plan provides the framework for the development of Byron Shire's pest control activities. Council will work with subcontracted control officers on a regular basis to assess current contexts, local goals and plan on-ground actions for each pest species for that year. This will allow for changing local circumstances (e.g. environmental, financial) and can help prioritise pest management on an annual basis.

5 Priority areas

A triage approach will be used with the resources that are available to Council, considering priority areas, current biosecurity risks and pest management priorities and goals.

5.1 Council land

Council will focus its pest management activities on key Council-owned and managed land as a priority (Figure 9). This will enable Council to meet its GBD and contribute to reducing pest animal impacts on Council-managed land and neighbouring lands. Council-owned and managed land may include parks, sports fields, footpaths and most roads. It also includes facilities such as offices, libraries, depots, landfill and transfer stations, airfield and halls.

	THRI HSERTS			
		No.	Site	Area Ha
1 mm	TATAL TRN DE	1	Bangalow Cemetery	2.14
		2	Bangalow STP	36.38
		3	Brunswick Valley STP	113.38
		4	Byron Bay Cemetery	2.38
	THE T-JALLANSON	5	Clunes Cemetery	8.39
	PINE FIL	6	Mullumbimby Horse Paddock	6.84
		7	Mullumbimby STP	275
The second se	- The The	8	Ocean Shores STP	38.74
PLANER PL		9	Resource Recovery Centre	67.04
	2 CHRold	10	Tyagarah Airport	54
		11	West Byron STP Wetland	103.28
	HISTOR WAR	12	Total	441.11
			% of Shire	0.82
Fgure 9: Priority Council owned and management	haged land for pest control			
Byron Shire Council Byron Shire Pest Animal Management Pla	an 2024		Property boun	dary
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Figure 9 Priority pest control areas on council-owned and managed land in Byron Shire

5.2 Privately-managed land

The management of pest animals on privately owned and managed land is the responsibility the land manager as part of their GBD and LLS is the primary support agency for this. Council, in consultation with LLS, may support on ground pest control programs on private land, where these enable Council to fulfill it's GBD on Council land, or where there is a significant biodiversity or community benefit.

Where it is possible and appropriate for Council to support actions on private land, where State Government funding is available, and with LLS support, private land will be prioritised based on one or more of the following criteria:

- high environmental values (including threatened species habitat, Council's high environmental values mapping and wildlife corridor mapping)
- cultural value
- significant farmland
- in-situ and/or adjoining existing pest animal control management programs (e.g. NPWS, LLS and/or known private land managers actively managing priority species).

Within the Shire, areas of high environmental value and Council-validated mapped koala habitat are considered as priority areas for pest management (Figure 10 and Figure 11). Significant farmland is identified on the NSW Far North Coast under Section 117 Directions of the NSW *Environmental Planning and Assessment Act 1979* for lands that should be retained as agricultural land use to support the development of the agricultural industries at State, regional and local levels. Private land managers either adjoining NSW protected areas such as national parks and nature reserves present opportunities to complement existing State-led pest animal control. If resources allow, Council has identified the following three areas as priority areas to support fox, feral cat and wild dog/dingo control programs on land owned or occupied by private land managers.

These areas include:

- Area 1-Upper Wilsons Creek, Huonbroock, Wanganui and Goonengerry (adjoined by Mount Jerusalem National Park, Nightcap National Park, Whian Whian State Conservation Area, Snows Gully Nature Reserve and Goonengerry National Park)
- Area 2-Broken Head and Suffolk Park (adjoined by Broken Head Nature Reserve, Ti Tree Lake Aboriginal Area and Ti Tree (Taylors) Lake Aboriginal Place), and
- Area 3-Tyagarah and Brunswick Heads (adjoined by Tyagarah Nature Reserve and Brunswick Nature Reserve).

Pest management on private land is primarily the responsibility of landowners and managers.



Byron Shire Pest Animal Management Plan 2024

ecosure improving ecosystems	Job number: PR8660 Revision: 0 Author: AS Date: 20/12/2024	0	1	2 km	GDA 2020 MGA Zone 56 Projection: Transverse Mercator Datum: GDA 2020 Units: Meter
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Data Sources: © State of Queensland (Department of Resources), 2024; © Ecosure 2024 ECOSURE does not warrant the accuracy or completeness of information displayed in this map. Any person using this map does so at their own risk, and should consider the context of the report that this map supports. ECOSURE shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.



igure 11 Areas of high environmental value in Byron Shire (south)			Are	Areas of High Ecological Value (HEV)			
Byron Shire Pest Animal Management Plan 2024			- Cyn		C LOAN	ooundury	
COSUTE improving ecosystems	Job number: PR8660 Revision: 0 Author: AS Date: 18/12/2024		0	1	2 km	GDA 2020 MGA Zone 56 Projection; Transverse Mercator Datum: GDA 2020 Units: Meter	

Data Sources: @ State of Queensland (Department of Resources), 2024; @ Ecosure 2024 ECOSURE does not warrant the accuracy or completeness of information displayed in this map. Any person using this map does so at their own risk, and should consider the context of the report that this map supports. ECOSURE shall beer no responsibility or liability for any errors, faults, defects, or omissions in the information.

6 Priority pest species

This Plan addresses the priority pest species identified in the Shire by the RSPAMP, including target species such as foxes, feral cats, wild dogs/dingoes, rabbits, Indian myna, cane toads, and emerging species such as feral pigs, feral goats and feral deer. These species were assessed as having the greatest impacts within the NCLLS region which includes the Byron Shire (NCLLS 2024). Through Council's community consultation process these pest animal species were also identified to be of most concern.

Target species are widespread species that are a high priority for management due to their high biosecurity risk, of which the management goal is asset-based protection.

Asset protection refers to preventing pests from damaging valuable property or resources. This includes things like protecting crops, equipment, fences, or threatened species from pests that could cause harm, ruin, or loss. Essentially, it's about keeping pests away from things that are important to protect the value and function of those assets.

Emerging species are species that are present in low densities and/or in localised populations, where the management goal is eradication or containment, based upon guidance from NCLLS (NCLLS 2024). The collaborative management of emerging species (with NCLLS and other relevant stakeholders) are a priority for Council as targeted and strategic management of emerging species is more cost-effective than the ongoing management required if populations become widespread. To prioritise the eradication and prevent the spread of emerging species, sightings of emerging species must be reported to LLS or Council and to FeralScan and can be anonymous.

Alert species are those species that are not established, but there is a risk that they may occur sporadically, therefore prevention is the primary management response, e.g. red imported fire ants. Management of alert species is coordinated by DPIRD, NCLLS and NSW DCCEEW, so these species are not addressed in detail in this Plan. For alert species, Council will continue to follow any management guidance given by DPIRD (see Section 6.3). The vertebrate pest animal incursion response is managed through consultation between NSW DPIRD, NCLLS and the NSW Department of Climate Change, Energy the Environment and Water (DCCEEW; NCLLS 2024).

A summary of management approaches taken for each species is summarised in Table 1 with more ecological information about various pest species in Appendix 8.

6.1 Target species

See Appendix 8 for detailed ecological information and breeding season. See Appendix 9 for guidance on species identification.

6.1.1 European red fox

Foxes were introduced into Australia for recreational hunting purposes. Densities and distribution of foxes in the North Coast region are not well documented, however, they are
believed to be widespread throughout the region, with higher densities in peri-urban areas (NCLLS 2024). Local impacts include the risk of foxes killing native mammals, groundnesting birds, frogs, fish, and other native ground-dwelling animals (DSEWPAC 2011, NCLLS 2024). Foxes can also harass, injure, and kill small livestock such as chickens, lambs and calves, can be a threat to domestic pets and can carry diseases to livestock, pets and humans (NCLLS 2024).

The regional goal of fox management is asset-based protection (NCLLS 2024), however, the regional approach to manage foxes is a secondary target through widespread baiting programs targeted towards wild dogs/dingoes (NCLLS 2024).

6.1.2 Feral cat

Introduced as pets, feral cats are opportunistic feeders, feeding on small mammals, birds, reptiles, amphibians and sometimes fish (DAF 2020c). Their predation is classified as a key threatening process to native wildlife and habitats. Rabbits may comprise up to 40% of a feral cats' diet, though this is highly dependent on rabbit availability (DAF 2020c). During times where rabbit density is much lower, there is a significantly higher number of native animals predated upon (DAF 2020c). Feral cats are estimated to predate on 61 million native birds and 53 million reptiles each year in Australia (Woinarski et al. 2017, Woinarski et al. 2019). In addition to direct predation, feral cats also negatively affect other native animals that compete for these food sources, such as quolls, raptors, and reptiles (DAF 2020c). Many feral cats thrive in urban environments and rely on supplementing their diet by scavenging rubbish scraps (DAF 2020c). True feral cats, however, do not rely on humans at all, and obtain all their food and shelter from the natural environment (DAF 2020c).

The regional goal of feral cat management is asset-based protection (NCLLS 2024), however, limited effective control measures for feral cats presents a significant obstacle to their management.

Local impacts and threats in the Shire include the risk of feral cats killing native mammals, ground-nesting birds and domestic pets and directly competing with native predators (NCLLS 2024). Feral cats also carry parasites that can be harmful to native wildlife (NCLLS 2024).

Under the *Companion Animals Act 1998* domestic cats are legally allowed to roam in NSW, and may only be lawfully seized if the cat is found in a public place prohibited under the Act (e.g. food preparation or consumption areas or wildlife protection areas). Abandoning domestic cats is illegal under the *Prevention of Cruelty to Animals Act 1979*.

6.1.3 Wild dog / dingo

Dingoes, feral dogs and their hybrids are collectively known as "wild dogs" under NSW legislation, despite differences in their physiology and behaviour (see Appendix 2).

Wild dogs/dingoes can at times pose a threat to native and threatened species such as koalas (DAF 2016), however there is also evidence showing dingoes reduce fox and cat abundance or activity and have an important ecosystem function (Mitchell & Banks 2005, Johnson & VanDerWal 2009, Brook et al. 2012, Gordon et al. 2015).

Within the Shire, wild dogs/dingoes are widespread in medium to high densities (NCLLS 2024). Regional threats include the risk of wild dogs/dingoes harassing, injuring or killing livestock, harassing and attacking people and domestic animals (i.e. pets), predation of native wildlife and spreading disease (NCLLS 2024). However, there can also be positive

impacts of wild dogs/dingoes, including positive impacts for livestock, threatened species and regarding the management of other pest species (Colman et al. 2014, BVL 2015, Brink et al. 2019, Harriot et al. 2019, Camus et al. 2023, Menon et al. 2024). If wild dogs/dingoes are killing livestock or koalas, they are likely to be considered a problem. If wild dogs/dingoes are killing foxes, feral cats, feral pigs or rabbits, they are likely to be considered more favourably. Management of wild dogs/dingoes that identifies and balances these positive and negative impacts is an important challenge for public and private land managers.

The regional goal of wild dog management is asset-based protection (NCLLS 2024). Finding a balance between wild dog/dingo management and dingo conservation is an important consideration for Council, especially considering the cultural significance of dingoes for First Nations Peoples (NCLLS 2024, Byron Shire Council 2023). Because the regional management objective for wild dogs/dingoes is asset-based protection, the assets under threat (people, livestock, domestic pets or threatened species) can be protected using a combination of preventative measures to protect priority local assets and targeted problem animal control activities in response to direct threats caused by individuals, rather than wide-scale, non-targeted population controls (such as aerial baiting; as recommended in the NSW Government Wild Dog Strategy 2022).

6.1.4 European rabbit

European rabbits were introduced into Australia for recreational hunting purposes. Competition and grazing by rabbits is listed as a key threatening process at both the Commonwealth and State level (OEH 2024), due to their ability to reduce recruitment and survival of native plants, cause widespread soil erosion, and fundamentally alter entire landscapes. Their competition with native species for food and destruction of native habitat has threatened native species in over two-thirds of mainland Australia (OEH 2024). Furthermore, erosion caused by their grazing can threaten culturally significant sites such as Aboriginal burial grounds (OEH 2024). Rabbit warrens can be three meters deep and 45 m long and can also cause destruction to buildings and gardens (Centre for Invasive Species Solutions 2011).

Complicating the issue is the fact that rabbits provide a food source for feral cats and foxes, maintaining higher numbers of these introduced predators (DPI n.d. [d]).

Wild rabbits are widespread in the region in low densities and within the Shire are mostly found in rural areas to the west of Byron Bay (NCLLS 2024). The regional goal of rabbit management is asset-based protection (NCLLS 2024).

6.1.5 European brown hare

There have been sporadic reports of hares in the Shire, and it is not clear whether hares are being misrepresented as rabbits in reports to Council, as they are similar physiologically (see Appendix 9). Like rabbits, hares pose an environmental threat through grazing and competition with native fauna for food and shelter. However, the threats from hares are less as they do not breed as fast as rabbits, and do not burrow, and as such they are not listed in key threatening processes or in the NCLLS RSPAMP.

Given that the aim of this Plan is to reduce the biosecurity risks posed by pest species, hares would also need to be considered with pest monitoring and control works in the Shire. Rabbits and hares share similar preferred habitats and can therefore be easily targeted through similar monitoring techniques. However, suitable control methods do vary between the two species, for example, hares do not create warrens and cannot be targeted by rabbit-

specific disease or fertility control.

6.1.6 Indian myna

Introduced into Australia in 1863 to control invertebrates, Indian mynas (also known as common mynas) are now found throughout Australia, with concentrations in urban areas and where native habitats have been fragmented by human activity (Pell & Tidemann 1997). Indian mynas are listed among 100 of the world's worst invaders by IUCN / SSC Invasive Species Specialist Group (Invasive Species Specialist Group 2011).

Indian mynas are opportunistic generalist omnivores. They usually forage on the ground but will also feed in flowering trees and bushes. Their diet includes invertebrates, bird eggs, small reptiles, food scraps, pet food, fledging birds, cultivated seedlings; the ripening fruit and seeds of plants such as figs, papaya, dates, apple, pear, tomato; and cereal crops such as maize, wheat and rice. In addition, they will scavenge around rubbish dumps and along roads where they feed on human food scraps and pet food. Indian mynas will also forage along the seashore for worms, molluscs, crustaceans and other seafood stranded on mud flats (Markula et al. 2009).

Indian mynas can cause damage to the environment through competition for resources and selective feeding, damage crops and infrastructure (through nesting), harass native species and spread parasites like lice to native species (NCLLS 2024). The regional goal of Indian myna management is asset-based protection (NCLLS 2024). As Indian mynas populate mostly urban areas, they can be managed by supported community programs (e.g. supporting community trapping by providing traps, personnel and educational resources to community trappers). NCLLS have stated that they will provide support for land managers conducting these community trapping programs in priority areas (NCLLS 2024).

6.1.7 Cane toad

Introduced into Australia in 1935 to control the grey-backed beetle, numbers of cane toads in Australia are now estimated to be over 200 million (Cohen 2021). Populations have spread from their initial locations in northern Queensland to the invasion front in northern NSW around the Clarence Valley (Cohen 2021).

Cane toads cause negative impacts in the Australian ecosystem by preying on and outcompeting native amphibian species and by poisoning native predators like freshwater turtles, goannas, raptors, snakes, quolls and dunnarts (Cohen 2021, DPI n.d.[c]). Cane toads are also considered an agricultural pest as they prey on beneficial insect species like dung beetles and bees (Cohen 2021).

Cane toads can be easily mistaken for several native frog species, including the Indian eastern froglet (*Crinia signifera*), tusked frog (*Adelotus brevis*), and great barred frog (*Mixophyes fasciolatus*; see Appendix 9). Distinctive features of cane toads include the bony ridges above the eyes and "M" shaped ridge above the nose, the horizontal pupil, warty skin, unwebbed inward-facing front feet, semi-webbed back feet and large parotoid (poison) glands behind the ear drum (Cohen 2021). Some of these features are present in native frogs but not all, therefore, all of these characteristics must be present to positively identify a cane toad.

The Shire is now exclusively a Movement Control Area where cane toads are established and are present at a density whereby asset-based management is the most cost-effective option of control (Movement Control Areas are denoted in green in Figure 12). At time of writing, the cane toad Active Control Area runs south-east from Woodenbong, through Kyogle, Casino, Maclean and Yamba. This map is currently being revised and will probably move south. The cane toad front (the line between toad free areas and established areas, moves at about 40-60 km per year (Storm 2016). The focus of control of cane toads in the Shire should be focused upon the protection of priority cultural, ecological and community assets that may be vulnerable to cane toads. Building community capacity for identification, reporting and community-based control will also assist control measures within the Shire.



Figure 11 NSW Cane Toad Biosecurity Zone Map. Green zones show Movement Control Areas where cane toads are established, orange areas are buffer zones and red areas are Active Control Areas which are "toad free". (Source: NSW Department of Primary Industries (DPI n.d. (c)).

6.2 Emerging species

6.2.1 Feral pig

Introduced to Australia at the time of European settlement as a food source, Feral pigs pose a threat to native wildlife populations primarily through habitat degradation, (e.g. destruction of sheltering sites) and the introduction of exotic weeds (Mathieson & Smith 2009). Due to their varied omnivorous diet (e.g. grain, sugarcane, fruit, tubers, worms, soil invertebrates etc.), feral pigs can have a significant impact on agricultural crops though uprooting, trampling and feeding. They have also been known to predate on livestock, including lambs. They can be responsible for damaging fences and dam walls, and dirtying water tanks and bore drains (DAF 2020). Feral pigs can degrade habitat and water quality for small terrestrial and aquatic animals, and examination of their faeces have shown remains of marsupials,

reptiles, insects as well as ground nesting birds and their eggs (DAF 2020).

A low-density population of feral pigs has been reported near Murwillumbah and north of Ballina, and there are also reports of an unmapped population in the Tweed, on the northern border of the Shire (NCLLS 2024). Management objectives for feral pigs in the region include containment (within the Shire) and asset protection for established populations elsewhere in the North Coast region (NCLLS 2024).

6.2.2 Feral goat

Goats arrived in Australia with the First Fleet in 1788. As they were convenient livestock for early European settlers. Today, more than 2.3 million feral goats live throughout Australia, occupying rugged terrain in all habitat types except for rainforests, extensive wetlands and deserts.

As selective browsers, they can negatively impact forested areas by disturbing biodiversity, trampling undergrowth and catalysing soil erosion. Damage is most notable during dry periods when resources are limited. They compete for food, shelter and water resources with native wildlife and domestic livestock, especially in semi-arid areas. Dingoes are known to predate on feral goats and can be effective at maintaining or reducing local population sizes.

The regional goal of feral goat management is containment (NCLLS 2024).

Between 2016-2023 the feral goat population has been expanding around Lismore and there have been recent reports of a population at Clarence River estuary islands (not within the Nature Reserve) near Yamba (NCLLS 2024), however, there are no known populations within the Shire at the time of writing.

6.2.3 Feral deer

Deer are indigenous to all continents except Antarctica and Australia. Introduced into Australia as game animals in the 19th Century, Australia is now home to six species of established feral deer-red (*Cervus elaphus*), rusa (*Rusa timorensis*), sambar (*Rusa unicolor*), fallow (*Dama dama*), chital (*Axis axis*) and hog deer (*Axis porcinus*).

Deer prefer open, grassy clearings in forests and woodland areas and now occur in many locations across Australia. Feral deer can impact a wide variety of agricultural crops, pastures and forestry plantations through competition with cattle and other livestock for pasture. Other impacts on rural properties include damage to fences and the spread of parasites (ticks) and diseases. Impacts to native vegetation / natural ecosystems include extensive damage to younger trees (saplings) throughout autumn (rutting season) by male deer removing velvet from their antlers (rubbing). Deer impact native vegetation by consuming leaves, small branches and bark throughout the winter months. These impacts are more prevalent if populations are high and environmental conditions are stressful. Feral deer assist with the spreading of weeds throughout the landscape and compete with kangaroos and wallabies for food. They often contribute to erosion and the fouling of natural waterways. Feral deer also pose a significant risk to human safety via the potential for vehicle strikes.

Their diet is determined by the availability of localised food sources. As their diet requires high levels of protein, deer will selectively target the highest quality plants (crops) in a paddock along with native species.

In the LGAs surrounding Byron Shire, the goal of feral deer management is containment

(NCLLS 2024). The Shire lies within the containment zone for feral deer in the North Coast region. Feral deer species that have been identified in the North Coast Region include rusa deer, chital deer, fallow deer, sambar deer and red deer, and all of these species as classified as emerging (NCLLS 2024). Hog deer have not yet been sighted in the North Coast region. Although the different species have different appearances (see Appendix 9), habitat preferences, behaviours and distributions, control measures and management are the same across all deer species. Due to a lack of information about deer in the Shire and the prioritisation of pests that are not yet established in the Shire, Council has added deer to the list of emerging species for this Plan. Any sightings of deer should be reported to Council (02 6626 7000; council@byron.nsw.gov.au) and/or reported on FeralScan/DeerScan (www.feralscan.org.au).

The Northern Rivers is one of the only areas left on the eastern seaboard of Australia where deer have not yet become established. Council is involved with the Northern Rivers feral deer alert project, aiming to increase community awareness of the serious impact of these species. Three sightings of feral deer (species unconfirmed) were reported to Council between July 2019 and March 2024.

6.3 Alert species

The following pest animals are classified as alert species which require immediate reporting to enable immediate action aimed at eradication. Appendix 9 provides an identification guide for the identification of these alert species:

- Red-eared slider turtle (NCLLS and Council alert species)
- American corn snake (NCLLS and Council alert species)
- Indian ring-necked parrot (Council alert species)
- · Red imported fire ant (Council alert species)
- Yellow crazy ant (Council alert species).

Alert species should be reported to DPIRD's Invasive Plants and Animals Enquiry Line, via telephone on 1800 680 244 or via email on invasive.species@dpi.nsw.gov.au. The management of alert species, including rapid response plans and initial response is managed through consultation between DPIRD, NCLLS and NSW DCCEEW, however, Council may be required to coordinate with NCLLS on responses to sightings or incursions of alert species and support incursion response. Council's duties for alert species also includes awareness-raising and monitoring programs.

Invertebrate species are particularly hard to manage once established in an area, so priority will be given to supporting incursion responses to invertebrate species. If in doubt, report.

Observations of emerging species (Section 6.2) should be reported to DPIRD and/or LLS as soon as possible.

7 General strategic action plan

General strategic actions are detailed in Table 3 including intent, principles of pest management (see Section 4), success measures (performance indicators) and responsibilities. Performance indicators, wherever possible, are specific, measurable, achievable, relevant and time-bound (SMART). These strategic actions (SAs) are critical to meeting Council's objectives (Section 1.3) during the life of the Plan.

Table 3 Strategic actions linked to the objectives of the Plan. Business as usual (BAU) identifies actions that will be regularly funded as part of Council's standard operating budget.

Action	Intent	Principle	Performance indicator	Finance & funding source	Responsibility			
					Lead	Partners		
Objective 1.1 Proactively manage pest animals according to Council's GBD to reduce biosecurity risk via a prioritised strategy of prevention, eradication, containment or asset-based protection of priority pest animal species on Council-owned and managed land.								

SA1.1.1 Manage pests on Council-owned and managed lands, and work with LLS to support the management on priority private lands where appropriate funding allows, to reduce biosecurity risk of pest species.	Conduct best practice pest management to reduce biosecurity risk of pest species on Council-owned and managed land and where appropriate and funding allows, support on priority private land.	Asset based protection Containment Eradication	Pest management outputs (e.g. numbers of pest animals removed, number of cages produced and used) collected and collated by Council. Best practice management assessed each year as part of the Pest Management Output Reports.	BAU	Council NCLLS	Private land mangers NPWS LALCs
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Action		Principle	ble Performance indicator	Finance	Responsibility	
	Intent			funding source	Lead	Partners
SA1.1.2 Ensure contractors follow safe, effective and humane approaches and maintain effective reporting, and continually improve by regularly evaluating impact, effectiveness, value and efficiency of Council's pest management program.	Council will ensure Council operators and contractors have the appropriate training, licenses, tools and technology to ensure workplace safety and appropriate data management. Monitor, evaluate and report on program outcomes annually by March-May each financial year to align with the overall pest breeding cycle, consequently its control. Seek feedback from relevant stakeholders and data to inform future program activities. Keep abreast of advancements in pest animal management technologies for consideration. Undertake a full review of the Plan nearing the end of the five- year period.	Asset based protection	Pest animal control is undertaken safely, humanely and in accordance with best practice. Pest Management Outputs Report is shared with all relevant stakeholders. Evaluations of Report form conducted annually and improvements made for subsequent planning. A full monitoring, evaluation and learning process at the end of each contract period.	BAU	Council	NCLLS NPWS LALCs Private land mangers

Action	Intent	Principle		Finance	Responsibility	
			Performance indicator	ھ funding source	Lead	Partners
SA1.1.3 Improve the mechanisms used to report on pest animal management and the impacts of pest animals by Council, including the promotion of FeralScan for community reporting.	Pest animal activity, evidence of pests, pest damage, and control actions should be entered into FeralScan and used by all land managers to help coordinate ground control in a local area. <i>If the person is seeking advice</i> <i>on management, they would</i> <i>need to contact LLS in the first</i> <i>instance.</i> Council to seek guidance on what details and how best to report to LLS and how best to obtain data for the Shire. This is important as pest animal data may assist in attracting funding for pest animal control at a <i>landscape scale, which all land</i> managers would potentially benefit from.	Prevention, Containment or Asset Based Protection depending on the pest animal.	Develop Pest Management Outputs Report template for reporting control (including numbers of trapped animals, species and trap location; challenges, issues and ways forward). Number of Council reports submitted to FeralScan is measured. Council to include FeralScan promotion in the Communication Plan by 2026. Council to liaise with NCLLS on pest animal reporting protocol by Year 1.	BAU	Council	NCLLS DPIRD Private land managers

Action		Principle	Performance indicator	Finance	Responsibility		
	Intent			& funding source	Lead	Partners	
 SA1.1.4 Investigate incentive opportunities with veterinary clinics to encourage private land managers to support responsible pet ownership. de-sexing and var domestic pets su domestic dogs, or rabbits humane control and Indian myna Vaccination of dome especially rabbits witi important should Co consider the release biological control tar rabbit such as the K calicivirus (more cor known as RHDV1 K 	Encourage responsible pet ownership to avoid feral animals by investigating opportunities for veterinary clinics discounting for:	Prevention	Council will continue to approach veterinary clinics seeking capacity to assist private land	BAU	Council	Veterinary clinics Private landowners	
	 de-sexing and vaccination of domestic pets such as domestic dogs, cats and rabbits 		managers with discounts for de-sexing and vaccination of domestic pets by 2030.				
	 humane control of feral cats and Indian myna 						
	Vaccination of domestic pets, especially rabbits will be important should Council consider the release of a biological control targeting the rabbit such as the K5 strain of calicivirus (more commonly known as RHDV1 K5).						

Objective 2.1 Foster collaborative and coordinated pest animal management with integrated activities by Council, First Nations people and community across the Shire, including engagement with regional land managers for strategic pest management of emerging pest species.

	Intent	Principle		Finance	Responsibility	
Action			Performance indicator	& funding source	Lead	Partners
SA2.1.1 Support NCLLS by promoting private land manager participation in pest animal management and through collaboration with neighbouring LGAs and other government agencies on pest management	Council will focus on relationship-building and sharing information. Promote the formation of private land manager groups collaborating in partnership with public land managers to implement pest animal control on land that they own or occupy. Promote awareness around private landowner GBD and services provided by NCLLS and other stakeholders. Liaise with public land managers and other stakeholders to aid a coordinated, proactive approach across land tenures	Asset based protection	Awareness raising related to GBD and NCLLS support services to be conducted at least twice before 2030. Relevant information is being shared to promote collaboration Work with other agencies and relevant groups regarding pest issues that might arise due to climate change.	BAU	Council	NCLLS
SA2.1.2 Ensure continued input and feedback on Council's pest animal management program from all stakeholders. Liaise with public and private land managers to ensure Council's targeted pest animal program is implemented in a strategic and proactive manner.	Liaise with public and private land managers (social media, emails, newsletters, phone calls, site visits and farmers market) to ensure Council's targeted pest animal program is implemented in a strategic and proactive manner. This will aim to improve the program monitoring, evaluation and reporting.	Asset based protection	Number of targeted engagements (e.g. social media, newsletters, farmers markets) is measured. Number of positive feedback reports to Council increases.	BAU	Council	Private land managers

Action	Intent	Principle		Finance	Responsibility	
			Performance indicator	ھ funding source	Lead	Partners
SA2.1.3 Promote the availability of technical advice and resources to private land managers in the Shire for pest animal management.	Promoting the services that NCLLS provide to private landowners and managers, so that pest management will be adopted more regularly, effectively and in a collaborative manner.	Prevention Asset based protection	Number of targeted engagements (e.g. social media, newsletters, farmers markets) on stakeholder roles, responsibilities and services is measured.	BAU	Council	NCLLS Private landowners
SA2.1.4 Foster collaboration between Council and local First Nations groups for ongoing pest management and encourage knowledge sharing between First Nations People and various stakeholders.	Council will engage with First Nations groups from the Shire and collaborate where possible on activities relating to pest management to improve the effectiveness of pest management activities and the protection of cultural assets. Improve communications between various stakeholders in regard to pest animals and pest animal control, including informing stakeholders of the cultural importance of dingoes and other totem animals to Indigenous culture and work together towards more sustainable approaches to pest management.	Asset based protection	First Nations groups from within the Shire will continue to be consulted with and contracted where possible. Investigate best practice on sharing information with First Nations groups. One knowledge sharing gathering arranged by Council if resources allow.	BAU / external grants BAU	Council Registered Native Title Bodies Corporate (RNTBCs) LALCs Council	LALCs RNTBCs NCLLS NPWS DPIRD Private land managers

Objective 2.2 Increase community engagement regarding pest animal management in the Shire, including benefits and best practice.

				Finance	Responsibility	
Action	Intent	Principle	Performance indicator	& funding source	Lead	Partners
SA2.2.1 Develop and implement a Pest Management Communications Plan for target pest species in the Shire.	 Through communication and engagement activities, the willingness of private land managers to manage pests can be increased. In line with the Community Engagement Policy, Council will: implement respectful communication and engagement with pest management partners identify and incorporate key messages e.g. private land manager GBD, pests impact articulate Council's roles and responsibilities in pest management promote the benefits of effective and collaborative pest management, along with the range of best practice management techniques and training opportunities for Council staff and private land managers promote and encourage responsible pet ownership 	Prevention Asset based protection	Pest Management Communication Plan developed. The number of targeted communications of various forms is measured (e.g., extension materials, e- newsletters, media coverage, social media, community meetings, farmers markets, email and text reminders etc.)	Council	Council	NCLLS NPWS LALC Private land mangers Landcare

Action	Intent	Principle	Performance indicator	Finance	Responsibility	
				& funding source	Lead	Partners
SA2.3.2 Respond to public enquiries that relate to priority pest species impacts and management using scripts.	Consistent information and messaging will help to ensure that Council's commitment to pest animal management and resources and services available for private land managers is clear, and enquiries are appropriately directed or re- directed.	Prevention	Scripts and training prepared and used by key Council staff.	BAU	Council	NCLLS Landcare First Nations Groups

Objective 3.1 Support pest management research and incorporate First Nations Cultural Knowledge and contemporary findings into the program.

SA3.2.1 Investigate opportunities to partner and/or support research and development that explores more effective, efficient and ethical pest animal management methods.	Support opportunities to trial new management approaches that seek to reduce the impacts of pest animals in humane and effective ways. For example, DPIRD Vertebrate Pest Research Unit is conducting large scale research and management project on pest animals in Northeast NSW and the University of NSW is conducting genetic testing and scat analysis of wild dogs/dingoes in NSW.	Asset based protection	The number of innovative pest animal management research programs supported by Council increased.	BAU	Council	NCLLS NPWS DPIRD LALCs Research institutions Private land managers

			e Performance indicator	Finance	Responsibility	
Action Intent	Intent	Principle		& funding source	Lead	Partners
SA3.2.2 Collaborate with First Nations People in research and development opportunities, particularly relating to non-lethal dingo management. WW to hc ln le fo cc Ex bu Ki	Build and share knowledge about Country, including mowledge about local dingo oppulations to provide a clear picture and guide management actions. Work with RNTBC's and LALCs o explore opportunities about now the Native Title Rights and nterests and Land Rights egislation may be applied to oster dingo research and conservation by 2030. Explore ways to respect and puild Aboriginal Cultural Knowledge into management actions	Asset based protection	One educational campaign completed by 2030 to share First Nations knowledge and cultural values relating to Country, especially regarding dingoes. The number of local First Nations People involved in pest research and development increased in the Shire.	BAU	RNTBCs LALCs Council	LALCs RNTBCs Council Research institutions

7.1 Funding and Resourcing

Council will continue to commit funds within available resources to managing the impacts of pest animals in the Shire and implementation of the Plan. Annual budget will be variable depending on Council resource availability and expenditure. Council will continue to seek external funding to support implementation of the Plan (e.g. Appendix 10). These funds enable Council to meet its statutory requirements for managing the biosecurity risks on Council-managed land. Availability of state government funding will influence Council's ability to continue support for the control of pest species on private land.

Council currently funds a Biodiversity Officer who leads pest management activities, along with other biodiversity and conservation responsibilities. This role allows the officer to dedicate two days per week to implementing the actions described in this plan. Additionally, the Council has Public and Environmental Officers who lead domestic animal management and enforcement across the shire.

8 Target species action plan

This section outlines the actions that will be undertaken by Council during the life of the Plan, specific to the management of each pest species. The target species action plan provides a more fine-scale plan for pest management outputs than the general strategic action plan (see Section 7). It outlines the roles and responsibilities of various stakeholders, and partners in Council-led actions. It also identifies potential funding options to support activities. More specific actions regarding pest management, including specific methods used and locations for control will be outlined in the Pest Management Output Reports, to be developed on an annual basis to support pest management activities in the Shire.

8.1 Stakeholder roles and responsibilities

Stakeholders include government, industry, community groups and individuals. Whether on private or public land, all land managers in NSW must comply with requirements outlined in the Biosecurity Act to control the biosecurity risk associated with pest species on land under their control, preventing or eliminated if reasonably practicable, otherwise minimising the risks on neighbouring land. Below identifies the actions that Council will take on Council owned or managed land. How other land managers meet their responsibilities is a matter for them, but Council's Plan can provide relevant local information and the RSPAMP can be used as a guide for pest management.

8.2 Target species action plan

Species-specific actions for target, emerging and alert pest species are outlined in Table 4. These actions align with activities identified in the NCLLS RSPAMP (NCLLS 2024).

It should be noted that Council has resolved not to use poisoned baits, or den/warren fumigation as part of their pest management activities. However, if other stakeholders choose to use these methods, it is strongly recommended that best practices are adhered to reduce negative impacts associated with these methods (see Appendix 7).

Table 4 Target species action plan

Objective	Success criteria	Partners	Lead	Timeframes	Finance and funding	Priority
Fox, feral cat, rabbit and hare man	nagement to reduce biosecurity risk					
Access Council sites for pest species evaluation. Implement annual fox, feral cat, rabbit and hare control program on Council land. Report all sightings, damage and control to LLS	Management strategies targeting multiple pest species (e.g. fox, feral cat, rabbit and hare) adopted, where appropriate. Council owned and managed land has reduced number of pests.	DPIRD NPWS NCLLS LALCs First Nations groups	Council	Pest Management Output Reports and plans for the following year updated before March - May Management ongoing	To be determined	High
Engage experienced and qualified trapper to undertake trapping of fox, feral cat, rabbit and hare on Council land.	Through appropriate procurement process an experienced trapper engaged to undertake trapping work.	Trapping subcontractor LALCs First Nations groups	Council	Ongoing annual contracts	In house	High
Provide monitoring and control data to public land managers to help contribute to existing monitoring programs e.g. Saving our Species.	Pest Management Output Report shared with relevant stakeholders. Report all sightings, damage and control to LLS	NCLLS NPWS LALCs First Nations groups	Council	Annually in November	In house	High

Objective	Success criteria	Partners	Lead	Timeframes	Finance and funding	Priority
Promote community awareness fox, feral cat, rabbit and hare impacts. Promote the importance of and enforce responsible pet ownership.	Reduced number of roaming/feral/abandoned pets. Actively engage with Public & Environmental Services team strategically to promote better community understanding about roaming pets.	DPIRD NCLLS NPWS Private land managers Private veterinarians Research partners	Council	Year 1 of PAMP	In house	Medium
Wild dog / dingo management to r	educe biosecurity risk – subject to ongoing re	search and be	st practice	e updates		
Implement annual wild dog/dingo control program.	Council owned and managed land has reduced number of pests.	DPIRD NPWS NCLLS LALCs First Nations groups	Council	Pest Management Output Reports reviewed and updated before March-May each year Management ongoing	In house	High
Engage experienced and qualified trapper to undertake trapping of wild dogs/dingoes that are a biosecurity risk.	Through appropriate procurement process an experienced trapper engaged to undertake trapping work.	Trapping subcontractor LALCs First Nations groups	Council	Ongoing annual contracts	In house	High

Objective	Success criteria	Partners	Lead	Timeframes	Finance and funding	Priority
Improve wild dog/dingo data collection and collation and provide Council sightings and control data (of widespread species) to public land managers to help contribute to existing monitoring programs e.g. Saving our Species.	Pest Management Output Report developed and shared with relevant stakeholders. Report all sightings, damage and control to LLS	NCLLS NPWS LALCs First Nations groups	Council	Annually in November	In house	High
Determine the purity of wild dogs/dingoes within the Shire.	Support at least one research project regarding dingo research within the Shire (e.g. DNA collection). Investigate resources for the DNA sample collection of all wild dog/dingoes trapped on Council land for genetic analysis.	Research partners e.g. UNSW LALCs First Nations groups Private landholders	Council	Ongoing	To be determined	High
Investigate and provide advice on non-lethal management methods to reduce the impacts of wild dogs/dingoes.	Investigate research partnerships to trial non-lethal management methods in local properties.	DPIRD NCLLS NPWS LALCs First Nations groups	Council	Ongoing	To be determined	Medium
Indian myna management to reduce biosecurity risk						
Review and evaluate the existing Indian myna Management Program.	Indian myna Management Program reviewed and evaluated with key recommendations for improvement provided, including reporting.	NCLLS	Council	Ongoing	In house	High

Objective	Success criteria	Partners	Lead	Timeframes	Finance and funding	Priority
Implement the Indian myna Program.	Number of birds trapped and community members tapping. Report all sightings, damage and control to LLS	NCLLS	Council	Ongoing	To be determined	High
Continue supporting the volunteer Indian myna trapping program on private land.	Support volunteer Indian myna trapping services to work with Council and private land managers.	NCLLS Byron Bird Buddies	Council	Ongoing	To be determined	Medium
Cane toad management to reduce	biosecurity risk					
Develop and implement a cane toad control program.	Deliver a cane toad control program.	NCLLS NPWS	Council	June 2025	In house	High
	On ground control to protect environmental assets	Private land managers				
	Report all sightings, damage and control to LLS	Landcare Byron Bird				
		Buddies				
Promote the use of Cane Toad Tadpole Trapping in specific ponds/water features managed by Council.	Site managers are aware of this control strategy.		Council	June 2026	To be determined	Medium
Emerging species management to reduce biosecurity risk						
Act as an agent to support the implementation of management actions across priority areas in response to feral goat, pig or deer sightings.	Support NCLLS in emerging species response as needed and where possible.	NCLLS NPWS DPIRD	Council	Ongoing	To be determined	High
	Report all sightings, damage and control to LLS	Private land managers				

Objective	Success criteria	Partners	Lead	Timeframes	Finance and funding	Priority	
Assist NCLLS in investigating the necessity of developing Byron Shire's Emerging Species Rapid Response Plans for each species.	Data is collated and evaluated.	DPIRD Neighbouring LGAs	NCLLS Council	June 2026	To be determined	High	
Raise community awareness of impacts of feral goats, pigs and deer and appropriate mechanisms for reporting.	Targeted community education programs and products delivered. Community sightings reported to NCLLS and FeralScan.	Community DPIRD NCLLS NPWS Private land managers	Council	Ongoing	To be determined	High	
Alert species management to reduce biosecurity risk							
Monitor and prompt report sightings of all alert species to DPIRD and FeralScan.	Any incursions are promptly identified and managed in partnership with appropriate stakeholders, including the provision of information and support to council staff. Targeted community education programs and products delivered to inform on alert species identification and reporting requirements.	DPIRD NPWS Private land managers	Council, DPIRD	Ongoing	In house	High	
When required, liaise with and assist relevant public land managers to respond to alert species reported on Council- managed land.	First responders are support by Council where appropriate.	NCLLS DPIRD DCCEEW	Council	Ongoing	To be determined	High	

9 Monitoring, review and reporting

The Plan remains in place for a five-year period and during that time will be implemented by Council to the fullest extent resources allow.

A monitoring, evaluation, reporting and improvement (MERI) framework has been developed at a state-wide level to oversee and standardise these procedures. The performance indicators listed in the general strategic action plan (Section 7) and target species action plan (Section 8) have been guided by the Statewide key performance indicators (KPIs) that NCLLS are responsible for reporting on within the North Coast region, which include:

- · the number of incursions of new invasive species in the North Coast region
- the number of successful eradications and containments of incursions of identified alert species outbreaks out of number of eradication programs rolled out within the North Coast Region
- the reduction in the distribution, relative abundance and/or impacts of selected widespread invasive species within targeted areas over a set timeframe
- the number of pest management training programs completed each year, and
- the number of active coordinated pest animal management and control groups each year.

9.1 Monitoring, evaluation and Plan reviews

Monitoring how effectively Council has undertaken its GBD and reporting will be conducted via the annual Pest Management Outputs Reports (to be developed by Council staff).

Pest management activities should not be only monitored and reviewed based on the outputs of control activities, but on reducing the negative impacts caused by pest animals (as per desired objective 1; Section 1.3). Therefore, if resources allow, surveys using motion-activated cameras are recommended to enable monitoring of:

- · pest species, including trends over time
- · the identification of alert or emerging species, and
- native species (including threatened species) and trends over time.

If resources are not available within Council, there may be opportunities for Council to support external stakeholders, such as research institutions, to conduct these surveys. Furthermore, collation of impacts reported to Council and NCLLS should also be undertaken by Council regularly to assess damage caused by pest animals in the Shire to better understand biosecurity risks.

Reviews of the implementation and effectiveness of pest management activities are to occur annually by way of the Pest Management Outputs Reports, and where required, minor amendments can be made to the Plan without the need for re-exhibition and adoption of the amended document. Any changes in pest distribution and population dynamics can be incorporated through these reviews. It is imperative that the Plan and the suite of actions are adaptable to changing conditions. The implementation will be evaluated through analysis of the Plan's success measures against the Pest Management Outputs Reports. A full review of the Plan will be undertaken nearing the end of the five-year period. Council intends to complete the annual review of the implementation plan a minimum of six months before the end of each financial year to align with the operational budget process.

9.1.1 Risk assessment of wild dogs/dingoes

As Council's GBD lies with managing biosecurity risks, an assessment specifically aimed at identifying risks associated with wild dogs/dingoes would be beneficial for informing ongoing management of wild dogs/dingoes in the Shire and to identify ways in which dingoes can be conserved within the Shire. Population research, including identifying whether threats are coming from dingoes or wild dogs would help guide management approaches. Analyses of fresh (<1 week old) scat can indicate diet and to what degree dingoes and wild dogs are feeding on native species, pest species and livestock. Diet analysis of dingoes and wild dogs has also helped extend range maps of native species and emerging species not known to exist in certain areas (Cairns 2024). Scat analysis (which allows for diet analysis as well as DNA analysis if the scat is fresh, see Appendix 2) would be the best approach to identify risk related to predation of livestock together with identifying purity of dingo population in the area. Furthermore, an analysis of hotspot areas with high levels of problem animal reports/high numbers of dogs being trapped or killed would help identify the underlying causes of conflict cases which could further help support management efforts. This assessment could only be conducted if resources allow or if co-funding is available (see Appendix 10).

9.1.2 Dingo DNA monitoring

DNA testing of any free-ranging dogs caught and killed in the Shire can be used to determine the percentage of dingo DNA within their genetic makeup (Cairns et al. 2023; see Appendix 2). By testing a sample of ear tissue, a cheek swab or hair from a wild canine, geneticists can analyse 195,000 DNA markers that differentiate between dingoes and domestic / feral dogs (Cairns et al. 2023). Where possible, samples from wild dogs/dingoes euthanased during pest control activities conducted by Council will be collected and submitted to researchers for DNA analysis to monitor changes in dingo and wild dog population dynamics in the Shire. This information could be used to inform the management of wild dogs/dingoes within the Shire.

9.2 Reporting

NCLLS will be required to report on the region-wide KPIs (listed in Section 9.1) on a quarterly basis and ideally Council's reporting to NCLLS should align with these requirements. Council will provide pest management data to NCLLS (sightings, control programs, numbers of animals trapped and shot) as per the requirements listed in the RSPAMP (Table 4; NCLLS 2024). Any sightings of alert species will be promptly reported to DPIRD and DCCEEW.

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Appendix 1 Byron Shire history of pest impacts and management

Council regularly implements measures to fulfill its GBD on Council-owned and managed lands and assists local communities and other stakeholders in fulfilling their GBD.

In late 2011, due to increased community concerns, Council commenced a pest animal management program targeting wild dogs/dingoes, European red fox (fox) and feral cats on Council-managed land and private land, which led to the development of the Feral Animal Management Plan 2013-15 (Byron Shire Council 2013). In 2012, operational actions from that plan were initiated, including a soft-jaw trapping program, which was implemented between autumn and spring each consecutive year, except in 2017.

By 2015, 64% of the actions identified in the Feral Animal Management Plan 2013-15 were fully completed, 14% of the actions were partly completed and 22% of the actions were not completed. Council then developed the Pest Animal Management Plan 2018-2023 (Byron Shire Council 2018). By 2023, 69% of the 16 strategic actions from the 2018-2023 Pest Animal Management Plan had been completed. Outstanding strategic actions included the annual development and review of Pest Management Output Reports for priority species, and the development of Pest Control Agreements for collaboration with private landowners. A review of the strategic actions from the 2018-2023 PAMP indicated the need for clearer success measures (performance indicators) and the development of specific, measurable, achievable, relevant and time-bound (SMART) goals and objectives to assist in future monitoring, evaluation, reporting requirements.

In April 2023, Council passed a resolution (Council Resolution **23-124**) acknowledging that dingoes are a native species essential to the culture of First Nations people and for ecosystem health, requiring care and attention (following Council resolutions on this subject: August 2023: **23-351** and April 2024: **24-166**). Subsequent engagement and research on dingo management was conducted to explore ways to reduce indiscriminate lethal control of dingoes while continuing to fulfil Council's GBD (see Appendix 2).

Community engagement over dingo management was subsequently completed with key stakeholders (broader community, farmers and First Nations stakeholders) to assess biosecurity risk and opinions regarding non-lethal dingo management (see Appendix 3).

Council has previously funded pest animal management, with some additional financial support from the NSW Government. Council covered the full cost to retain a private trapper who conducted pest animal trapping on Council lands, supporting private landholders when it was beneficial to management on Council lands and when resources allowed. Similarly, funding and grants from the NSW government have periodically covered the costs of appointing an invasive species officer. In the past, this officer has worked with the community to manage other pest animals, such as cane toads and Indian mynas. The management of these species also relied heavily on trained community volunteers that were supported with technical advice and equipment (such as traps) from Council. The programs were well received by the broader community and have partly continued (with Indian mynas) beyond the grant, but associated travel expenses for trained community volunteers' places uncertainty over the future of these types of services.

The collaborative approach between Council and private land managers is highly efficient in terms of surveillance and the timely detection of pest animal incursions. It recognises that pest animals move across land tenures, and it promotes support and coordinated localised

on-ground action, with shared responsibility and cost. Furthermore, community feedback demonstrated that monitoring and control data communicated regularly helped motivate participating private land managers to continue with pest programs. Sharing positive results through newsletters, meetings and local media also helped boost support from the community.

The support from NSW government grants presented Council with an opportunity to extend beyond its statutory requirements to manage pest animals on Council-managed land and allowed the expansion of the soft-jaw trapping program across broader areas of prioritised private land. However, limited Council capacity and State Government support has inhibited a strategic approach on private land. Furthermore, while the collaborative approach promoted localised support and good initial coordination of on-ground action, over time it has falsely raised private land managers' expectations that Council has an obligation to fund or undertake actions to manage pest animals on private land, when this is not the case. Management of pests on private land is the landowner's responsibility, with North Coast LLS the agency primarily responsible for supporting private landowners. Uncertainty about Council's ability to access NSW government grants means Council must first prioritise management on Council-owned and managed land to meet its obligations to ratepayers to meet statutory requirements. A triage approach to pest management must be established to make the best use of limited Council capacity and resources.

Several research initiatives have been conducted in the Shire and surrounding areas that have produced data that could influence pest management in the Shire. A summary of these research findings can be found in Appendix 11.

Appendix 2 Dingoes

Dingo data from Byron Shire

Data about wild dogs/dingoes from North Coast LLS (including Feralscan reports) shows a high amount of lethal control of wild dogs/dingoes compared to problems reported across the Shire. Lethal control of wild dogs/dingoes outweighs damage reported between 2019 and 2023 (Byron Shire Council 2023b; Figure 13). Reporting to FeralScan is vital because current data may underrepresent the true scale of the wild dog problem. It likely misses many landholder sightings, attacks, and control efforts, as many landholders manage wild dogs privately, without involving LLS or FeralScan. Additionally, FeralScan may overreport damage by including both observations and actual harm, which can skew the results.

Accurate reporting helps build a clearer picture of the issue and improve management efforts. This is, aligned with nation-wide trends showing that control of wild dogs/dingoes outweighs damaged caused. Figures on the cost of wild dogs/dingoes control and damage vary widely, however, recent figures released by the ABARES indicate that significantly more money is spent nationally on wild dog/dingo control than the damage they cause on livestock (\$110 million spent for management and \$76 million in damages prevented in 2020-2021; Hafi et al. 2023). Council received only two reports directly from private landowners of wild dogs/dingoes causing damage between 2018 and 2023 and six out of 10 farmers engaged via email in May 2023 said they had livestock killed by wild dogs/dingoes (see Appendix 3). Since 2012, FeralScan data shows reported damage by wild dogs/dingoes at only four separate locations across the Shire (Figure 14).

Increasing and improving the capture of data on wild dog/dingo damage in the Shire has been identified as a priority action within the NCLLS RSPAMP draft (NCLLS 2024), the community survey and consequently, in this Plan.



Feralscan observations and damage reports

Number of wild dogs / dingoes killed Shire-wide





Figure 13 Locations of wild dog/dingo observations, damage and control measures 2012-2023 (Source: Byron Shire Council, Local Land Services and FeralScan 2024).
Legislation considerations

Dingoes, feral dogs and their hybrids are collectively known as "wild dogs" under NSW legislation. Under the Biosecurity Act, all land managers have a legislative requirement to manage biosecurity risk associated with biosecurity matters on lands they own/manage and the risk to neighbouring lands, this includes risk posed by dingoes.

Previously legislation required all land managers to "fully and continuously supress and destroy" dingoes and wild dogs on Schedule 1 lands under the general destruction duty ordered under the *Wild Dog Destruction Act 1921* and the LLS Act. To balance the control of wild dogs with the conservation of dingoes, the general destruction obligations on Schedule 2 lands included conservation objectives alongside control, as agreed upon by LLS and the land occupier. Since the repeal of these stipulations in 2015 by the Biosecurity Act, land managers are now only required to fulfil their GBD regarding wild dogs and dingoes, meaning they are only required to control wild dogs/dingoes if they are posing a biosecurity risk (DPI 2015). This repeal allows for dingo conservation to take place alongside the GBD of land managers in NSW. However, how to measure biosecurity risk and whether the risk extends outside of the land managers' land is not specified.

In addition, predation and hybridisation by feral dogs is listed as a key threatening process for dingoes under the BC Act. This indicates that control of feral dogs should be prioritised over the removal of pure dingoes. However, recent genetic studies show that hybridisation between dingoes and wild dogs is extremely uncommon (Weeks et al. 2024).

Recently the First Nations Dingo Declaration has raised awareness on the species' cultural importance and the need to reassess management of wild dogs/dingoes.

First Nations People have advocated for a different model to be implemented that brings together cultural and western knowledges. This new model should incorporate traditional knowledge, and evidence-based practice, focusing on peaceful co-existence between dingoes and all stakeholders. At the time of writing, First Nations groups, NGOs and Ministers of Parliament are calling for an NSW Parliamentary inquiry into dingo management in a bid to help protect dingoes and reduce control programs like aerial 1080 baiting, that harm dingoes and Country (Maxwell 2024).

Differences between dingoes and dogs

Domestic dogs are a subspecies of the wolf (*Canis lupus*) and are thought to have been domesticated around 30,000 years ago to the various domestic dog (*Canis familiaris*) breeds available today. Although historically referred to as *Canis familiaris* (AMTC 2024), recent research indicates that dingoes evolved from New Guinea singing dogs (also known as the New Guinea highland dog; *Canis lupus hallstromi*) which are an ancient lineage of dog that has not historically been domesticated (Souilmi et al. 2024). This research may reignite calls for dingoes to be reclassified as a separate species or subspecies to domestic dogs (e.g. *Canis dingo* or *Canis lupus dingo;* Cairns 2021). Dingoes appear to have evolved over 50 different genes (associated with reproduction, metabolism and neural development) differently from New Guinea singing dogs, indicating their adaptation to the environment in Australia (Zhang et al. 2018).

Determining the difference between domestic dogs, feral dogs and dingoes based on visual assessment is not always reliable. This is made more difficult due to some dog breeds (e.g. Australian cattle dogs) showing evidence of past hybridisation with dingoes (Arnstein et al. 1964). Combining a visual assessment with behavioural assessments can be more reliable

and some experts, including local First Nations people can distinguish between them. However, currently DNA analysis is the best way to distinguish between dingoes, dingo/dog hybrids and feral dogs.

Dingo and wild dog DNA

While earlier genetic studies suggested that widespread hybridisation of dingoes with domestic/feral dogs was threatening the purity of dingo populations, new research (e.g. Cairns et al. 2021 and Cairns et al. 2023) shows that there is much more dingo purity in the wild than previously thought, and very few feral dogs. After analysing the DNA using improved genetic testing of over 5,000 wild canids, only 1% were feral dogs and 98.8% of wild canids had over 50% dingo DNA (Cairns et al. 2021). Dr Cairns and her team's recent studies use methods that look at over 195,000 genetic markers, rather than the 23 markers used in earlier genetic studies. According to these researchers, populations of dingoes with high genetic integrity should be prioritised for conservation (UNSW Newsroom 2019). In northeastern NSW pure dingo hotspots have so far been identified in Port Macquarie, Myall Lakes and the Washpool National Park area, and researchers recommend a more balanced approach towards conservation and management in these hotspot areas.

These newer genetic studies suggest that there may be much less hybridisation between dingoes and domestic dogs than previously thought. The data shows that, rather than being one homogenous genotype, there is a lot of regional genetic variation between pure dingoes living in different parts of Australia. It is possible that this regional genetic variation has previously led to some pure dingoes being misclassified as hybrids. Dr Cairns and her team from UNSW are now carrying out further genetic studies to see if they can identify other hotspots of high dingo purity in the Great Dividing Range. Very little DNA analysis using these new DNA analysis approach has been done with samples directly from the Shire. However, through this Plan, Council aims to work with trapping subcontractors to collect samples from controlled wild dogs/dingoes to get a better understanding of the levels of dingo purity within the Shire to help inform management and future research and conservation efforts.

Dingo and wild dog management advancements

Contention is building around the use of lethal control of wild dogs/dingoes, especially in light of new genetic research indicating that the free-roaming canines in Australia are predominantly dingoes (Cairns et al. 2020, Cairns et al. 2023), as well as the First Nations Dingo Declaration (Appendix 4).

The National Wild Dog Action Plan (2020-2030; AWI 2020), a wool industry led plan, emphasises that wild dog management should be risk-based and humane. The NSW Wild Dog Management Plan reiterates that wild dog/dingo management should prioritise reducing negative impacts rather than large-scale removal of pest animals and it notes that this is particularly the case for wild dog management, where certain "problem dogs" cause disproportionate damage (NSW Government 2022). Both the Action Plan and the Management Plan call for improvements in wild dog/dingo management and innovations that can add to best practice models for effective, wild dog/dingo management.

The lethal control of wild dogs/dingoes is largely driven by the agricultural industry due to the financial burden and emotional stress experienced by farmers who have livestock predated by wild dogs/dingoes. However, the money spent managing dingoes can be more than the losses that this control negated (Figure 4; Hafi et al. 2023). This is a complex issue because lethal control reduces the population of individual wild dogs or dingoes, which may have helped decrease losses. However, it can also negatively impact dingo packs, potentially increased conflict. Additionally, significant changes in the landscape have made resources

more abundant, leading to imbalanced ecosystems that influence species traits and behaviour. Therefore, further local research on this issue is essential.

While wild dog control and dingo conservation is often pitched as a battle between the agricultural industry and other stakeholders, a balance needs to be found between pest control and dingo conservation that maintains the GBD of all parties involved but allows for dingoes to provide the ecosystem services that promote healthy ecosystems and that protects them for their cultural significance.

Protection of agricultural assets and the conservation of dingoes are not mutually exclusive objectives and can be achieved by prioritising risk-related control and non-lethal preventative measures. With NSW legislation identifying that minimising the risk of impacts of wild dogs/dingoes is the key for fulfilling GBD, the question lies with what is considered a risk. With research indicating that not all wild dogs/dingoes are a threat to livestock and data showing that they can help maintain and reduce invasive species, population-wide control to reduce numbers (e.g. baiting) may not be an effective, nor cost-effective long-term approach to wild dog/dingo management. Lethal control using more targeted methods (e.g. trapping and shooting) are more suited to targeting wild dogs/dingoes in precise areas where they pose a direct threat to livestock, domestic pets or people. This risk-based approach helps address the precise threat at play (fulfilling GBD) and allows dingoes not causing problems to remain in the population and continue to provide their ecosystem services. This approach is also more aligned with Commonwealth, State and regional objectives to use an asset-based protection approach for established pest species.

Case study: Minyumai Indigenous Rangers

The Minyumai Rangers work in the Minyumai IPA-a 2,100-hectare site in Gumbainggirr Country (south of Bundjalung Country).

The Rangers are implementing new First Nations-led dingo management in the area that involves camera traps sourced from World Wildlife Fund (WWF) Eyes on Country program to monitor dingoes in their area. Scat analysis already conducted found that their dingoes are eating mostly native species rather than livestock, including swamp wallabies, snakes and berries and pest animals (pigs and feral cattle). They found pig remains in the dingo scats in their sample, further supporting the theory that dingoes hold an ecosystem function of maintaining / reducing invasive species. With these findings, the Minyumai Rangers are trying to dissuade NPWS from baiting in the National Park areas nearby.

Case study: K'gari QPWS rangers

A unique situation occurs on K'gari (formally Fraser Island) where a population of pure dingoes come into conflict with tourists and other people on the island. Dingoes have been formally managed by Queensland Parks and Wildlife Services (QPWS) since 2001 and since 2013 have incorporated Traditional Owners, the Butchulla people, in coordinated dingo management. Like in most other areas of Australia, the dingoes (known locally as "wongari") have cultural significance to the Butchulla, and their conservation has been given a high priority on K'gari.

Efforts to reduce the risk posed by dingoes to humans living and visiting K'gari, QPWS conduct extensive education and awareness campaigning to improve human behaviour around dingoes to minimise risk. Research of dingo ecology, behaviour and health on the island is critical to managing mitigation measures to reduce risk. Through this research, the K'gari rangers have been able to identify and monitor spatial and temporal patterns to dingo conflict and apply non-lethal mitigation measures (e.g. exclusion fencing around communities and campsites, and restricting access to anthropogenic food sources) to high-

risk places and at high-risk times (e.g. breeding season). Individual dingoes causing conflict are collared and closely monitored. If repetitive risky behaviour continues despite non-lethal mitigation measures, and a direct threat to people by a specific dingo remains, only then is lethal control (restricted to the problem-causing dingo only) considered as an option. Using this approach, conflicts on the island have reduced over time, and lethal control has rarely been required to manage human-dingo conflicts on K'gari.

Case study: Myall Lakes dingo management project

In 2019 this project commenced in the Myall Lakes area between Port Macquarie and Newcastle following community concerns over targeted dingo culls. The project aims to use research and non-lethal management strategies to promote a harmonious coexistence between people and dingoes. This area includes national parks, tourist areas and residential areas and includes livestock, threatened species, pets and invasive species.

This project was co-designed by numerous stakeholders including two LALCs. It focuses on evidence-based, individual-focused management of dingoes using strong partnerships and community involvement. Research in the area has focused on density estimates of dingoes, identifying individuals, identifying spatial and temporal activity patterns, behaviour and DNA analysis. Using this information, they have been able to identify that dingo densities increased proportionately with high human densities, underlining the need for risk-mitigation. High-risk areas were identified (e.g. campsites) and non-lethal mitigation measures implemented (e.g. exclusion fencing to stop dingoes resting under campsite infrastructure). A 24-hr hotline for dingo sightings and incidences has been helpful in collecting data and allows for swift responses to problems. Education and awareness campaigns aimed at local communities have been incorporated to help reduce risky activities conducted by residents and visitors (e.g. feeding dingoes).

Possible improvements for dingo management in the Shire

During the First Nations stakeholder workshop conducted in June 2023, non-lethal dingo management specialist Dr Neil Jordan (coordinator of the Myall Lakes Dingo project) suggested that the following questions should be addressed as a preliminary step in improving dingo and wild dog management in the Shire. Question that should be addressed include:

- · How many wild dogs/dingoes are in the Shire?
- Where are they and when are they most active (daily and season temporal patterns)?
- What are they (dingoes or wild dogs i.e. DNA)?
- What are they eating (which helps establish risk)?

A camera trap survey would help establish how many wild dogs/dingoes are in the Shire and will establish where and when they are (spatial and temporal patterns of activity). What they are (proportion of dingo / wild dog DNA) could be established by non-lethal (hair, scat, saliva samples) and / or lethal (tissue samples from dead wild dogs/dingoes) sampling and subsequent DNA analysis conducted by a collaborative research institution. What they are eating can be established by diet analysis using scat (faeces) sampling, which can help inform what risk they are posing. Improved reporting on livestock depredations can help identify conflict hot spots and improve the understanding of diet preferences. This could help guide lethal control strategies and where to conduct DNA sampling to better understand if there are correlations between DNA results and livestock predation. The aforementioned information would help inform not only wild dog/dingo management and dingo conservation in the Shire but would also help inform the management of other pest species and the impacts on native species (including threatened species).

Costs associated with these activities would need to be shared with any partnering research institutions. At present, some research institutions are conducting diet and DNA analysis at no cost to those who collect the samples. If Council were to source their own motion-activated camera traps to conduct ongoing monitoring of native species and pest animals, they could be purchased for between \$150 and \$1,150 per unit (with more expensive models being more reliable and producing clearer photos). Any number of cameras could be used for monitoring, however 20-50 cameras would be ideal for camera trap studies, depending on the design of the monitoring surveys. Local First Nations groups are eligible for funding for cameras through the WWF Australia "Eyes on Country" funding scheme, and this may be an activity that could be subcontracted to the First Nations groups in the area. Data collection and analysis would be a significant expense and would need to be outsourced to a research institution.

First Nations rangers could be engaged by Council for dingo and wild dog management, as they have exceptional knowledge and experience on Country and have unrivalled knowledge of and respect for dingoes (including the ability to visually distinguish between wild dogs and dingoes) that would ensure that dingoes are protected. Council will work with relevant stakeholders to improve dingo conservation efforts.

Appendix 3 Community consultation results

First Nations stakeholder workshop

A First Nations stakeholder workshop was hosted by Council on 19 June 2024 at Durrumbal Hall to discuss issues surrounding pest animal management in the Shire (Bundjalung Country). Attendees were invited from local representative Aboriginal organisations including the Bundjalung of Byron Bay Aboriginal Corporation (Arakwal), Widjabul Wia-bal Gurrumbil Aboriginal Corporation, Jali Local Aboriginal Land Council (LALC), Ngulingah LALC, Tweed Byron LALC and the Madhima Gulgan Community Association, as well as guest speakers from Minyumai Rangers, University of New South Wales (UNSW) and K'gari to share knowledge of their ranger programs and how they are incorporated cultural knowledge into pest animal management. Council particularly wished to hear First Nations stakeholders' views on dingo management in the Shire. Nine participants from the local representative organisations attended the workshop.

Key messages from participants were:

- Dingoes are a culturally significant species for First Nations peoples and there is a strong desire for them to be conserved and protected.
- Dingoes and wild dogs are different, and participants wish for them to be separated under legislation and vernacular, and separate approaches taken for management.
- Dingoes help keep Country healthy from the top down, including helping to control pest animals like feral cats, foxes, rabbits and deer.
- First Nations rangers should be engaged by Council for work relating to environmental issues (including pest control) given knowledge and experience on Country and respect for dingoes. This includes ability to tell dingoes and wild dogs apart. If there are areas where capacity building is required participants would like Council to facilitate skillssharing workshops with the various First Nations groups.
- First Nations groups would like to see an evidence-based approach to dingo management that includes population monitoring (including DNA sampling and camera trapping) and research (e.g. scat analysis, collaring) to help identify what risks dingoes are causing in the Shire. Participants believe this should be conducted before any widespread baiting is conducted by any stakeholders.
- The participants prefer trapping and shooting of pest animals and do not want baiting, as this harms Country. "Baiting doesn't just kill dingoes, it's killing Country" one participant advised.
- First Nations groups would like Council's help to engage with other land managers (NPWS, private landowners etc.) to help them understand the importance of dingoes to Aboriginal culture and work together towards more sustainable approaches to pest management that protects dingoes.

Online survey results

An online survey regarding pest animals was published on the Council website between 18 July and 26 August 2024. During that time, 78 responses were received. Results are summarised below.

Respondents and their properties

Most respondents lived on residential lands in rural areas (51%), residential lands in urban areas (32%) and on agricultural lands with livestock (13%). Of the 10 respondents that kept livestock, nine kept cattle, two kept horses, and one kept chickens and ducks.

Pest species on their land

The most frequently seen pest species on the respondent's land were cane toads, roaming pet dogs, Indian mynas, roaming pet cats, foxes, feral cats, wild dogs/dingoes and rabbits (Figure 15). Notably, one respondent mentioned seeing European hares (*Lepus europaeus*), which are not recognised as a priority pest in the Region (refer to Section 6.1.5).

A total of ten respondents (13%) had seen emerging or alert species on their land, including feral deer (3 respondents), Indian ring-necked parrots (2), feral pigs (1), red imported fire ants (1) and yellow crazy ants (1). When asked to whom these incursions were reported, or to whom they would report any incursions in future, most respondents said they had reported or would report to Council (36%), LLS (27%) and Feral Scan (18%). In total, 24% of respondents said that they were not sure who to report incursions to, and 9% (7 respondents) said that they had seen emerging or alert species but had not reported them to the authorities. This indicates the need for increased public awareness campaigns about what species are emerging and alert species, the importance of reporting them to authorities and to whom they should be reporting these sightings.



Figure 14 The frequency that pest species were seen accumulative totals when ranked from 1 (never seen) to 5 (seen daily) by all respondents

Problems with pest species

Respondents were asked to rank species that were the biggest problems on their properties, from 1 (not a problem) to 5 (major problem). The accumulative scores indicated that the species causing the most problems were cane toads (score of 266), feral cats (195), Indian mynas (180), and foxes (176) (Figure 16). The most problematic species differed slightly depending on the land uses of the respondents, with respondents on agricultural lands listing cane toads, dingoes / wild dogs and foxes as the biggest problems; respondents from rural residential areas listing cane toads, foxes and feral cats as the biggest problems, and respondents from urban residential areas listing cane toads, Indian mynas and feral cats as

the biggest problems.



Figure 15 Problem species' accumulative totals when ranked from 1 (not a problem) to 5 (major problem) for all respondents on varying land uses

In total 65 respondents listed specific ways in which they were negatively impacted by pest animals, which include predation of native wildlife, livestock and domestic pets and the harassment of domestic pets and people. Of those that listed impacts 28% (18 respondents) specifically mentioned roaming cats and dogs causing negative impacts, including harassing, injuring and killing native wildlife. Other respondents included the concern about increasing cane toad numbers, individual's experiences of them seeing pests killing native wildlife and respondents reiterating that problems exist with feral dogs and that their opinion that dingoes should be taken off the pest species list. When asked about any positive impacts of pest animals, many of the respondents said that there were no positives, while some enjoying seeing foxes and rabbits, and one reporting that Indian mynas eat the ticks off cattle. Ten respondents said that they enjoyed seeing and hearing dingoes on their property and reiterated their opinion that dingoes should not be considered a pest species.

Pest management and control

Of the 78 respondents, 59% (46) reported that they manage pests on their property and 26% (20) reported that they do not have pest animals on their property. 15% of respondents (12) across all land uses reported that they had pest animals causing problems on their properties but were not conducting any management (Figure 17), which is a violation of their GBD.



Figure 16 Responses from differing land uses when asked if they manage or control pest animals

Of the 46 respondents that controlled pests on their farms, 65% (30 respondents) incorporate non-lethal control measures, including exclusion fencing / barriers / netting (12 respondents), scaring pests away (10), livestock guardian dogs (4), using predator-smart livestock management (e.g. breeding seasons and keeping young livestock safely enclosed; 3), and using livestock guarding donkeys (2). Four respondents did not incorporate lethal control at all into the pest management.

The most common forms of lethal control were trapping (27 respondents), shooting (14), hand captures (for cane toads; 6), and poison baiting (4) with most respondents saying that these were effective or partially effective at controlling pests on their land. Of the respondents, 55% were opposed to at least one method of lethal control (Figure 18) with baiting (1080 and other baits) and den / warren fumigation being the most widely opposed methods.



Figure 17 Methods of lethal control that respondents were opposed to.

When asked about what factors influenced their choices of lethal control options, the highest ranked motivating factors were those that protected the environment, protected human safety, the humaneness/ethics involved, those that protected agricultural resources and livestock, and those that avoided using baits or toxins. Interestingly the cost of the control method was the least important aspect that influenced uptake with the respondents, with only 14 respondents (18%) saying it was a very important factor influencing their choice of control methods.

Respondents were asked to list the species they believed need to be controlled in order from top priority (score of 9) to least priority (Figure 19). The species that respondents listed as the top priorities for control were cane toads (cumulative score of 386), feral cats (373), wild dogs (312), foxes (272) and Indian mynas (226). Wild dogs were listed as the third priority species for control, even though they were only listed as the fifth species causing significant problems. Ten respondents reiterated that only wild dogs / feral dogs should be controlled and that dingoes should be left alone.

Ten respondents from the online survey specifically reported that roaming domestic dogs and cats should be a high priority for pest control efforts.



Figure 18 Species that respondents believe should be prioritised for control, based upon scores derived from respondents listing their top priority species (score of 9) and subsequent species (score of 8, 7, 6 etc. respectively)

A total of 28% of respondents from the online survey reported that they were not aware of their GBD and a further 23% of respondents were unsure of their GBD, indicating a need for further awareness-raising regarding land managers responsibilities regarding reducing the biosecurity risk of pest species on the lands that they own or manage.

Services conducted by Council

Almost half (49%) of respondents were willing to collaborate with Council on pest management activities, with 32% of respondents not sure whether they would be willing to collaborate. Respondents were asked what services they would like to see Council perform

and the top ranked responses were more surveillance of roaming pets and penalties for irresponsible pet ownership, support for pest management and control on private properties and incentives for responsible pet ownership (e.g. sterilisations; Figure 20).



Figure 19 Services that respondents want Council to perform in the Shire.

Domestic pets

In total 69% of respondents kept domestic pets on their properties, with 80% of those pet owners reporting that all their pets were sterilised. This suggests that there is only a small risk that pets are breeding with feral animals to contribute to the numbers of pests in the Shire. However, the large number of survey responses reporting negative impacts that roaming pets are having indicates considerable negative impacts that roaming pets are having on local wildlife, livestock, domestic pets and people.

When asked about the frequency of pest species seen on their land, roaming pet dogs and roaming pet cats ranked the second and fourth most seen pests respectively (Figure 15). The frequency that these roaming pet species were seen was unexpectedly high, with 73% having seen roaming pet dogs and 69% having seen roaming pet cats (Figure 21). Specifically, 30% of all respondents had seen roaming pet dogs either on a weekly or daily basis and 24% of all respondents had seen roaming cats on a weekly or daily basis. These results indicate that roaming pets could be having more of an impact on local assets in the Shire, including native wildlife, than was previously believed. Domestic pets are not covered in the scope of the Plan; however, these data indicate a significant problem that needs to be addressed.





Wild dog / dingo management

Throughout the survey, respondents repeatedly mentioned that dingoes and wild dogs were different, with many reporting that they would like to see dingoes not be referred to as a pest species. 27% of respondents (21) said that they would like to see Council support research into non-lethal dingo management innovations. Furthermore, 18% of respondents said that they would like to be involved in any non-lethal dingo management trials that may take place in the Shire (Figure 22).



Figure 21 Responses when asked if they'd like to be involved in a non-lethal dingo management trial

Farmer engagement emails

An email was sent by Council to a network of around 400 local farmers on 4 May 2023, inquiring about issues with wild dogs/dingoes and other pest species. Eleven people replied to the email, 10 described a range of problems with wild dogs/dingoes, foxes, feral pigs and feral cats. Impacts on the respondent's farms ranged from pests killing livestock (cattle,

sheep, geese, horses and chickens), bringing in disease and parasites and killing native animals. Five respondents had not had livestock killed by wild dogs/dingoes and/or foxes. Eight respondents reiterated that the wild dogs that were causing problems had physical characteristics of domestic dog breeds and did not look like dingoes. Four respondents mentioned they had tried using 1080 baits to control wild dogs/dingoes reporting back some success but having trapping and shooting as preferred method. One respondent mentioned they had removed 36 wild dogs/dingoes in three weeks from their property but were then overrun with foxes and feral cats which had detrimental effects on the native wildlife on their farm. Only one participant mentioned using non-lethal control measures (chasing dogs away from livestock) and another stated that livestock guarding dogs and donkeys were not suitable to the environment on their farm, but that they had not tried these tools themselves. Four respondents said that trapping and shooting wild dogs/dingoes was the most effective means of control.

Appendix 4 First Nations Dingo Declaration



National First Nations Dingo Declaration

Dingoes are known by many names across Australia: Binure, Buyubarra, Dwert Mooyel, Ganibarra, Jinabara/ Madla Yalpa, Mirragang, Ngalmbu, Ngawa, Ngugum, Ngwangwal, Ootalkarra, Warrigal, Wartaji, Wabubarra, Wilkerr, Wetya, Wongari, and many others.

The Dingo is deeply sacred to Australia's First Nations peoples. They are family.

Dingoes are a part of our individual and collective identity, important for men and women, and our totems, Dreaming, lore/law and customs. They are embedded in our spirit through Storytelling, a part of our creation, rituals, ceremonies, art, dances, and songs. We are one being, spiritually connected from the Dreamtime to eternity.

The Dingo is a cultural icon representing a vital connection to Country whose significance cannot be put into words. As Creator and Dreamtime Beings they formed the lands, the waterways, and constellations. They mapped our ancestral Songlines across this continent. The Dingo is essential to keep our storylines, custom and culture alive.

Dingoes remain deeply embedded in the daily lives of First Nations peoples as companions, hunting partners, protectors, and family members. They share our same experience of atrocities and journey of survival.

Dingoes are the Boss of Country. They belong in the landscape. Their presence in the ecosystem ensures natural systems remain in balance. This role is greatly underappreciated. The direct and indirect effects of the Dingo on native and pest species are clear and apparent.

Dingoes are genetically, physically, and behaviourally different to domestic dogs, and must not be treated as such. If it looks and behaves like a Dingo, it is Australia's Dingo.

We do not support the use of the term 'wild dog'. This term diminishes the Dingo. It is a deliberate misrepresentation to justify killing. It disrespects and disregards culture.

Colonisation has and still impacts our relationship with the Dingo. Since European colonisation and introducing livestock, assumptions around Dingoes have led to them being cruelly targeted by trapping, shooting, poisoning, exclusion fencing, desexing, and bounty programs across Australia. These practices seek to eradicate the Dingo from Country, and are inhumane, ineffective, unnecessary, and have devastating consequences.

We do not, and have never, approved the killing of Dingoes. Killing Dingoes is killing family. We demand an immediate stop to this 'management' across Australia. Lethal control should never be an option.

We advocate for a different model: caring for Dingoes on Country. This model sees Dingo recognised in legislation as—a culturally significant and protected native species. This model must use traditional knowledge, and evidence-based practice, focusing on peaceful co-existence between Dingoes and all stakeholders. This brings together cultural and western knowledges.

We demand our rights to have our voice, and capacity to apply culture in all matters relating to the Dingo. We have the right as Traditional Custodians to be directly involved in decision-making in all legislation and management actions that impact Dingoes, across all levels of government.

In 2009, Australia endorsed the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), but has yet to honour its commitment. In defence of our inherent sovereign rights and the preservation of the Dingo, we the undersigned, invoke UNDRIP articles 25 and 26.

To honour and revitalise our ancient relationships with Dingoes, we, the undersigned, collectively welcome Dingoes back to our care as our Creator Beings, companions, and kin. By doing so, we seek to uphold custodial responsibilities to restore balance across the lands and waters. We exist in a symbiosis. When you remove Dingoes, Country gets sick, we get sick. A healthy Country is essential for spiritual, physical, emotional and intellectual wellbeing.

We assert the truth of this statement as the basis to restore our cultural obligations and rights in alignment with our lore/law and custom. These are intrinsically connected to the Dingo as kin.

As the undersigned individuals from our respective Nations, together with our allies across society, we are determined in walking together to make real the demands of this Declaration. We commit to empowering people to effectively uphold cultural and environmental obligations, and aspirations, of protecting the Dingo.

Appendix 5 Relevant legislation

Table 5 Relevant legislation, strategies and plans relating to pest animal management.

Native Title Act 1993	The Native Title Act recognises the rights and interests of Aboriginal and Torres Strait Islander People in land and waters according to their traditional laws and customs, including the right to care for Country.				
Environment Protection and Biodiversity Conservation Act 1999	 The EPBC Act describes key threatening processes subject to threat abatement plans. Relevant threat abatement plans include: predation by European red fox predation by feral cats predation, habitat degradation, competition and disease transmission by feral pigs competition and land degradation by unmanaged goats competition and land degradation by rabbits the biological effects, including lethal toxic ingestion, caused by cane toads. Under the definitions of the EPBC Act the dingo are a native species as it has been in Australia for over 4,000 years, however, under this Act, domestic dogs and dingoes are classified as the same species. <i>Canis familiaris.</i> 				
Australian Pest Animal Strategy 2017-2027	 This strategy provides guides for the consistent management of pest plants and animals across the country. The strategy sets national priorities and goals, discusses principles of effective pest animal management and encourages a coordinated and strategic approach across a range of stakeholders. The dingo is also considered a significant pest animal under the Australian Pest Animal Strategy 2017-2027 (DCCEEW 2017). Stages of management identified in this strategy include: prevention of species not yet established in Australia eradication of a newly arrived species at either a local, regional, State or national scale containment of a species that cannot be completely eradicated to reduce or limit its spread into at-risk areas 				

Commonwealth

	 asset protection, which may be applied to manage threats of species that have spread too far to be eradicated or contained, with the aim of strategically minimising economic, environmental and social impacts. 				
National Wild Dog Action Plan 2020-2030	This Action Plan, written by the wool industry, outlines preventative and control measures for managing wild dogs/dingoes across Australia.				
Threat Abatement Plans	These plans aim to reduce the impact of listed threatening processes on native species and ecological communities. Plans have been developed for threatening pests including rabbits, foxes, feral cats, feral pigs, tramp ants, cane toads and specific grasses.				
National First Nations' Dingo Declaration 2023	Released in 2023 following the Inaugural First Nations Dingo Forum. The declaration highlights the cultural significance that dingoes hold in the cultures of First Nations people and strongly advocates for non-lethal control of dingoes. The declaration also admonishes the term "wild dog" and claims it is a "deliberately misrepresentation to justify killing" of dingoes. Noting the ecological role that dingoes play in Australia, they refer to dingoes as "the Boss of Country". The Declaration recommends a new model for dingo management that uses evidence-based practices that incorporates traditional knowledge and focuses on peaceful coexistence.				
New South Wales					
Land Rights Act 1983	The Land Rights Act recognises the traditional ownership of the land by First Nations Peoples and acknowledges the importance of their connection to Country. Local Aboriginal Land Councils operate under the Land Rights Act and the Act provides a system for Aboriginal communities to regain ownership of certain lands in NSW.				
Biosecurity Act 2015	The Biosecurity Act requires Council to discharge its GBD on all land it manages, which includes taking measures to prevent, minimise or eliminate the risk of negative impacts of biosecurity matters on Council and neighbouring land, as far as reasonably practicable. Under Biosecurity Act pests are managed by their risk and is not by defined species.				
Biodiversity and Conservation Act 2016	 The BC Act defines protected species as all native species of Australia, but specifically excludes dingoes. The <i>Biodiversity and Conservation Act 2016</i> lists the following as key threatening processes: competition and grazing by the feral European rabbit competition and habitat degradation by feral goats herbivory and environmental degradation caused by feral deer 				

	 invasion and establishment of the cane toad predation and hybridisation by feral dogs (as a key threatening process to dingoes) predation by the European red fox predation by the feral cat, and predation, habitat degradation, competition and disease transmission by feral pigs. 		
Local Land Services Act 2013	Identifies the roles and responsibilities of Local Land Services in NSW, including biosecurity obligations such as pest animal, pest plant and disease prevention, management, control and eradication. This includes responsibilities including preparedness, response and recovery for pest emergencies and other emergencies impacting on primary production or animal health and safety. LLS can appoint an authorised officer who has the authority to examine, seize, detain, remove or destroy any pest in or about premises or is being kept in captivity without lawful authority.		
Game and Feral Animal Control Act 2002	Provides a framework for the effective management of invasive species and game animals, including outline responsible hunting practices for game animals on public lands. This is particularly relevant to feral deer. In 20 ² the NSW legislation requiring hunters to hold a game hunting licence to hunt deer on private lands was suspended due to increasing deer numbers.		
Companion Animals Act 1998	Provides guidance for the identification and registration of companion animals and for the duties and responsibilities of pet owners. Under this Act, dingoes and dingo hybrids can be legally bred and kept in captivity in NSW.		
Pesticides Act 1999	Outlines controls for the use of pesticides in NSW, with the aim to reduce risks to human health, the environmen property, industry and trade. The Pesticides Act recommends collaborative and integrated policies for the use of pesticides.		
Prevention of Cruelty to Animals Act 1979	This Act aims to prevent cruelty to animals, promote animal welfare and humane care. The Act requires a persor be in charge of the animal, who is responsible for their welfare and care.		
<i>Biosecurity Regulation</i> 2017	This Regulation lists mandatory measures for the management of some pest species. This legislation forbids the vaccination of rabbits with a live virus (e.g. fibroma virus or myxomatosis virus vaccine) unless approved by the Chief Veterinary Officer (Part 2 Section 17A). Section 17B also prohibits the possession, movement or release from captivity of camels, deer, pigs, rabbits and foxes with the exception of permitted exhibited animals, and permitted research activities, if the action is included in part of a lawful measure to control a pest or if the animal is dead.		

Firearms Regulation 2017	Provides specific details and regulations relating to the possession, use and sale of prohibited weapons and firearms, including those used in pest animal control activities.				
Local Land Services (Wild Dogs) Pest Control Order 2015	This Order, relating to the Biosecurity Act, repealed Part 10 of the LLS Act which covers the management of wild dogs on Schedule 1 and Schedule 2 lands in NSW. It also repeals parts of the <i>Wild Dog Destruction Act 1921</i> and rename it to the <i>Border Fence Maintenance Act 1921</i> . This Order changes the management of wild dogs from a general destruction duty to a GBD, which means wild dogs are only required to be killed if they are posing a biosecurity risk.				
Biosecurity Strategy 2013- 2021	- The NSW Biosecurity Strategy 2013-2021 (Department of Primary Industries 2013) provides the strategic direction for the management of plant and animal pests, weeds and diseases. The strategy focuses on biosecurity risks that impact the environment, community and economy. This Strategy was superseded by two documents-the NSV Biosecurity and Food Safety Strategy 2022-2030 and the NSW Invasive Species Plan 2023-2028 (see below).				
Biosecurity and Food Safety Strategy 2022- 2030	This strategy succeeds the NSW Biosecurity Strategy of 2013-2021 and covers the management of pests relating to food security. It is a high-level document that outlines broad goals, key priorities, and overarching principles for managing biosecurity and food safety in New South Wales, rather than providing detailed operational plans of specific actions. Pest animals are covered in the NSW Invasive Species Plan (see below).				
Invasive Species Plan 2023-2028	This plan supports the NSW Biosecurity and Food Safety Strategy 2020-2030 and identified key deliverables in t management of existing pest populations and responses required to prevent new incursions, and response required to contain and eradicate emerging pest populations. This plan covers terrestrial, freshwater and mari vertebrate and invertebrate pest animals and invasive plants.				
Wild Dog Management Strategy 2022-2027	Developed to reduce the negative impacts of wild dogs in NSW in balance with the preservation of the ecological role of dingoes. In this strategy, "wild dogs" refer to any dog living in the wild, including feral dogs, dingoes and their hybrids. The strategy focuses on the importance of evidence-based and coordinated wild dog management and emphasises that activities should focus on reducing negative impacts and focusing on "problem" dogs that cause disproportionate impact, rather than the widespread removals of wild dogs. This Strategy identifies the risks imposed by wild dog and dingoes.				
Regional and Local					
North Coast Local Land	Pest management in the Shire is guided by the RSPAMP, written in 2018 and updated in 2024. The RSPAMP is				

Services Regional Strategic Pest Animal Management Plan - RSPAMP - 2024-2029 (draft)	responsible for identifying and prioritising pest species at a regional scale, which guides the prioritisation of pest species in this Plan. The RSPAMP details roles and responsibilities for stakeholders at a regional scale and lists KPIs for NCLLS. At the time of writing, the RSPAMP is under public review and has not yet been finalised.			
Byron Shire Council Integrated Pest Management Policy 2024- 2028	Provides a policy framework for the effective and efficient control of pests on Council-managed land through an Integrated Pest Management approach that uses a range of appropriate prevention and control methods while minimising the use of poisons (such as 1080) and den fumigation. This Policy provides a framework for effective control of pests while minimising the use of poisons on a continuous improvement basis and seeks to support a transition from a reliance on poisons. In supporting the Policy, the use of poisons such as 1080 will not be the preferred option to manage pests such as wild dogs/dingoes, foxes or feral cats in council owned and managed land, therefore other options to manage pests such as wild dogs/dingoes, foxes and feral cat will need to be employed. The IPM Policy also calls for monitoring to underpin all pest management activities.			
Byron Shire Integrated Pest Management Strategy 2019-2029	This Strategy builds upon the IPM Policy and provides information regarding pest management, describes control methods, provides an IPM Framework and describes tools supporting IPM including Council's poison exclusion and minimisation zone maps and decision trees and invasive plant species lists. Although primarily developed to address management of pest plant species, it also applies to some control methods used for pest animal species.			
Byron Shire Rural Land Use Strategy 2017	This Strategy provides a strategic framework to guide future land zoning and use, protection and / or development of rural areas, including the environment, community, economy and infrastructure. The aims of the strategy are to provide a framework to allow Council and the community to deliver improved outcomes in rural areas. The strategy identifies the need to provide information and advice on pest management to the community (Byron Shire Council 2018).			
Byron Shire Dogs in Public Spaces Strategy 2022-2032	This Strategy helps guide responsible management of dogs in public places for the approximately 10,000 microchipped domestic dogs residing in the Shire (Byron Shire Council 2022). This strategy aims to protect humans, other pets and wildlife within the Shire, and measures within this strategy should help reduce the amount of lost dogs that could contribute to the wild dog population in the Shire. This is particularly relevant to wild dog/dingo management in the Shire as there are high to medium registered domestic dog densities in the Shire, including areas adjoining Council-managed land.			
Byron Shire Community	The Byron Shire Community Strategic Plan 2032 outlines the vision, community objectives and supporting strategies			

Strategic Plan 2032	 which guide Council's long-term decision making. The Plan aligns with the Community Objectives, as below: "Community Objective 3 We partner to nurture and enhance biodiversity, ecosystems, and ecology in that the Policy is framed to guide pest management decision-making with respect to pesticide cessation in some areas and minimisation in others; while also enabling a discretionary use by Council in either area if deemed necessary to meet its pest management obligations." "Community Objective 5 Provide a safe, reliable, and accessible transport network and provide accessible community facilities and open spaces in that the Policy will contribute to providing a road network which is safe, accessible and maintained to an acceptable level of service through a continuous improvement Integrated Pest Management basis."
Byron Shire Council Climate Change Adaptation Plan 2021- 2026	Outlines the threats the Shire faces from the impacts of climate change, including details on how climate change impacts can increase the distribution of weeds and pest animals. Details mitigation measures for climate change impacts in the Shire.
Byron Shire Pest Management Output Reports Council will develop Pest Management Output Reports to guide the management of particular pest so draft operations plans for wild dogs/dingoes, fox and feral cats (Byron Shire Council 2017) and India Shire Council 2020). These plans, developed and adapted annually, are for the internal use of Council planning, management and monitoring, evaluation reporting and improvement using standardised k also develop a template for developing Pest Management Output Reports that includes priority ar for the following year.	

Appendix 6 Relevant stakeholders

NCLLS should be the first point of contact for landholders seeking advice and support with managing pest animals under their GBD.

Table 6 Relevant stakeholders involved in pest animal management

Jurisdiction	Description
Juligaletion	Description

Commonwealth	
Arakwal People Native Title Determination and associated Indigenous Land Use Agreements (ILUAs)	On 30 April 2019, Arakwal People represented by the Bundjalung of Byron Bay Aboriginal Corporation (BOBBAC), celebrated their native title consent determination. As the Traditional Owners of lands within their determination area, Arakwal People hold many, varied rights and interests over those lands. Refer to BOBBAC and the Determination and supporting ILUAs for information on native title rights and interests.
Widjabul Wia-bal Native Title Determination and associated Indigenous Land Use Agreements (ILUA)	On 19 December 2022, Widjabul Wia-bal People represented by the Widjabul Wia-bal Gurrumbil Aboriginal Corporation (WWGAC), celebrated their native title consent determination. As the Traditional Owners of lands within their determination area, Widjabul Wia-bal People hold many, varied rights and interests over those lands. Refer WWGAC or to the Determination and supporting ILUAs for information on native title rights and interests.
Commonwealth Government	Many biosecurity management functions are administered by the Commonwealth Government, but NSW Government has primary responsibility for pest animal management. The Commonwealth Government provides overarching policy and management guidelines for pest species, for example the Australian Pest Animal Strategy 2017- 2027, threat abatement plans for threatened species and national action plans for pest species. The Commonwealth Government also provide support for State, regional and local governments in managing pest species, especially emerging and alert species. This work is largely conducted through the Federal Department of Agriculture, Fisheries and Forestry.
Centre for Invasive Species Solution	The Centre for Invasive Species Control in collaboration with DPIRD, with funding from the Australian Government, manage the FeralScan website and app and all data collected on pest animals across Australia. These data are available to landowners, and various government agencies via their LLS.
National Wild Dog Action Plan Committee	This National Wild Dog Action Plan committee is responsible for overseeing the strategic implementation of the National Wild Dog Action Plan-a livestock industry-driven initiative for wild dog/dingo management that promotes a coordinated approach to manage the biosecurity risks associated with wild dogs/dingoes. The committee works with stakeholders and land managers across State and Commonwealth Governments and consults regularly with the various State Wild Dog Advisory Committees and Landholder groups regarding wild dog/dingo management.
New South Wales	
Local Aboriginal Land Councils (LALC)	The purpose of Local Aboriginal Land Councils is to improve, protect and foster the best interests of all Aboriginal People in the local area. LALCs have the right to be involved in the planning, protection and preservation of cultural sites and areas under the NSW Aboriginal Land Rights Act on land within their boundaries. There are three Local Aboriginal Land Councils whose boundaries overlap with the Byron Shire, they are Tweed Byron LALC, Jali LALC and Ngulingah LALC.

NSW Government The NSW Government has primary responsibility for pest animal

Jurisdiction	Description			
	management. In addition the State Government has a GBD to manage the biosecurity risk of pest animals on NSW Government owned land, for example Crown Land. For established pest management activities, planning, and coordination LLS is the lead agency within the NSW Government. The NSW Government provides Standard Operating Procedures for the effective and humane management of pest animals.			
Department of Primary Industries and Regional Development (DPIRD)	The DPIRD is responsible for policies relating to pest management and takes the lead role in managing new terrestrial and aquatic invasive species as well as aquatic species in general. They also work together with federal agencies and regional stakeholders to raise awareness and help manage invasive weeds, and emerging pest species including invertebrate pests and marine and aquatic pests. DPIRD also coordinates pest animal training and accreditation services. DPIRD coordinates the Vertebrate Pest Research Unit which works together with stakeholders experiencing negative impacts of pest animals and institutions conducting research with the goal of improving evidence-based pest management. DPIRD is responsible for taking measures to prevent, minimise or eliminate the biosecurity risks from pests on DPIRD owned or managed lands, as far as reasonably practical as part of DPIRD's GBD.			
State Pest Animal Committee	The State Pest Animal Committee was established in 2017 and is a ministerial advisory committee that oversees the formation and operation of the Regional Pest Animal Committees, the Regional Strategic Pest Animal Management Plans across the state and advising on and implementing regional and State pest animal policies and regulations. The State Pest Animal Committee is also responsible for improving reporting on pest animals across the State and is involved in considering response options for high-risk incursions.			
Regional and Loca	al			
Local Land Services	LLS are a subset of the NSW Government that provides planning and coordination of pest management at a regional level. LLS facilitates public and private land manager participation in invasive species management, including education and compliance related to land manager obligations under the Biosecurity Act and the LLS Act. LLS is responsible for planning and coordinating terrestrial vertebrate pest management programs. LLS also provides operational assistance during invasive species incursions and surveillance operations. LLS is the primary authorised distributor for the vertebrate pest poison sodium fluoroacetate (1080) and provides 1080 and other pesticide training for landholders.			
	The North Coast Pest and Weed Advisory Committee falls under NCLLS and they facilitate planning and prioritisation of pest management, collaboration and partnerships, and program coordination and review for pest management activities. The North Coast Pest Technical Working Group (NCPTWG) identifies technical and operational issues and makes recommendations on solutions to the North Coast Pest and Weed Advisory Committee. LLS is responsible for taking measures to prevent, minimise or eliminate the biosecurity risks from pests on LLS owned or managed lands, as far as reasonably practical as part of LLS's GBD.			
NSW National	A number of state recreation areas and National Parks in the Byron Shire			

Jurisdiction	Description				
Parks and Wildlife Service	are managed under Indigenous Land Use Agreements (ILUAs) between the NSW Government and Bundjalung of Byron Bay Aboriginal Corporation on behalf of the Arakwal People, including Wagun/Cape Byron State Conservation Area and Arakwal National Park.				
	NPWS is responsible for undertaking pest management to mitigate biosecurity risks associated with pest species in the National Parks estate and, when resources allow, on neighbouring properties as part of its GBD. NPWS is also an authorised distributor of 1080, primarily for baiting programs within NPWS estates.				
Forestry Corporation	The Forestry Corporation manages the native and plantation forests and is involved in pest animal management when the pest animals within the forestry reserves are a biosecurity threat to neighbouring properties. The Forestry Corporation also allows recreational hunting on some of its lands, and this can be used to manage pest animals that are a biosecurity risk.				
Crown Lands	NSW Crown Lands is responsible for managing the NSW Crown Estate (land and waters owned by the State Government for the benefit of the general public), which makes up 38% of all land in NSW.				
	Crown Waterways are generally managed by Crown Lands or other NSW Government agencies, like NSW Transport. Crown lands can be directly managed by Crown Lands or other NSW Government agencies, managed by community groups appointed by Crown Lands or managed by local councils. The agency or group appointed by Crown Lands is responsible to manage biosecurity risks from pests on the crown lands or waterways under their control.				
Byron Shire Council	Council is responsible for taking measures to prevent, minimise or eliminate the biosecurity risks from pests on Council owned or managed lands, as far as reasonably practical as part of Council's GBD. Although not a legislative requirement, when it is appropriate to do so, and if resources allow, under the coordination of LLS Council can offer assistance with pest control activities on adjoining lands where there is a benefit to the Council owned or managed lands.				
First Nations People	Lands within the boundaries of the Byron Shire are the traditional lands of the Bunjalung People. Bundjalung Country extends from Grafton on the Clarence River in northern NSW to Toowoomba region in southern Queensland and down around the other side of the Great Dividing Range. Within Byron Shire, First Nations Peoples include:				
	 the Bundjalung of Byron Bay Aboriginal Corporation representing the Arakwal People and Widjabul Wia-bal Gurrumbil Aboriginal Corporation representing the Widjabul Wia-bal People who have native title rights and interests, see Section 2.2.3 and Appendix 5) 				
	 Members of Tweed Byron, Jali and Ngulingah Local Aboriginal Councils 				
	 All Aboriginal and Torres Strait Islander Peoples living on lands in the Byron Shire. 				
	First Nations People hold the songlines and dreaming of the Council of an area and as true custodians, prioritise caring for Country and preserving natural and cultural resources.				

lurisdiction	Description
Junsuiciton	Aboriginal Corporations, Lands Council and indigenous entities can be engaged for work relating to environmental issues (including pest control) as they have unique and valuable cultural knowledge and experience on Country including knowledge of and respect for dingoes that will ensure that dingoes are protected. This includes their ability to tell dingoes and wild dogs apart.
Private Landowners	Private landowners / managers are required to take all reasonable and practical steps to prevent or minimise biosecurity risks relating to pests, to be aware of their surroundings and take action to prevent the introduction and spread of pests, diseases, weeds and contaminants on lands that they manage. Collaborative approaches to pest management between stakeholders (i.e. neighbouring private lands and Council) are encouraged to improve effectiveness. Private landowners / managers have a GBD to report any emerging or alert species they see to LLS.

Appendix 7 Pest management methods

Table 7 Best practice pest management methods and tools

Management actions	Pros	Cons	Costs	Other considerations and risks
Non-lethal methods				
Livestock guarding dogs (LGDs)	Can reduce livestock predations significantly in goat and sheep herds (van Bommel & Johnson 2023) Once trained, very little intervention is required Can be effective at reducing livestock predations and therefore can reduce dependence on lethal control (van Bommel & Johnson 2023)	Little evidence for effectiveness with cattle Maremma breed dogs are the only LGD breed widely available in NSW Ongoing monitoring and health care is required to maintain effectiveness Can be susceptible to snake bites	Purchase costs of Maremma breed vary between \$600- \$2,500 Regular feeding required and the installation of automated feeders if livestock remain in paddocks day and night Regular vaccinations and parasite control required to minimise risk to other domestic animals and livestock Research has shown LGDs can be cost-effective, with a financial break-even point reached within 1–3 years of implementation, depending on the livestock type being protected (van Bommel & Johnson 2023)	If not trained and monitored adequately, LGDs may attack and harm livestock, native wildlife and humans Maremma LGDs undergoing a long training process and are not able to guard livestock until they are over two years of age If proper veterinary care is not followed, they could become a vector for disease or a host for parasites that could spread to livestock, and pets
Livestock guarding donkeys	Can reduce livestock depredations significantly in goat, sheep and cattle herds Require very little	Can become aggressive to livestock if not integrated well into the herd	Purchasing a donkey can cost between \$750-\$10,000. Veterinary care would need to be maintained to reduce	Although anecdotal evidence claiming the effectiveness of livestock guarding donkeys, this method has not been

Management actions	Pros	Cons	Costs	Other considerations and risks
	intervention and minimal training Anecdotally donkeys are very effective specifically against canine species (e.g. wild dogs/dingoes) Do not require special feeding like LGDs and live longer than LGDs Can be effective at reducing livestock predations and therefore can reduce dependence on lethal control	General animal health must be considered due to Laminitis (an inflammation of the laminae of the foot – the soft tissue structures that attach the coffin or pedal bone of the foot to the hoof wall). Donkeys are susceptible to laminitis, especially if they have access to rich pastures or are overweight. Regular hoof care, monitoring and appropriate grazing management can help mitigate the risk.	disease and parasite transfer to livestock. Generally regarded as a cheaper alternative to lethal control	thoroughly tested or reviewed in the scientific literature. Anecdotally they work best if an individual donkey is kept with the livestock herd (not multiple donkeys) or a jenny with a foal.
Exclusion fencing	Can be used to prevent predators from entering paddocks / pens where vulnerable animals are located Can be effective at reducing livestock predations and therefore can reduce dependence on lethal control Provides long-term protection if properly maintained	Can be expensive to install, with varying designs (and associated varying costs) depending on which species need to be excluded Require ongoing maintenance Fences can be damaged by large wildlife such as kangaroos or pest species like feral pigs If pests penetrate the exclusion zone, they may be difficult to remove Large-scale exclusion	Costs depend on what species need to be excluded. Elaborate designs e.g. 950 mm tall with an apron at the bottom and secured with poles every three meters costs approximately \$6,800 per kilometre to install (DAFF 2023)	The use of barbed wire should be avoided, as it can injure and kill native wildlife e.g. gliders (Petauridae spp.; Mo et al. 2021) Exclusion fencing can be difficult to install in rugged areas or areas with waterways

Management actions	Pros	Cons	Costs	Other considerations and risks
		fencing can negatively impact native species e.g. restricting movements		
		Large-scale exclusion fencing can increase livestock damage caused on neighbouring farms (e.g. with wild dogs/dingoes)		
Deterrents	Various deterrents can be used from visual deterrents (e.g. lights or fladry), olfactory deterrents and sound deterrents Can be effective at reducing livestock predations by mammalian carnivorous pest species and therefore can reduce dependence on lethal control	Deterrents usually provide only short-term effectiveness unless used sporadically and randomly Can be costly to purchase and maintain (e.g. batteries)	Costs associated with the purchase of the deterrents, installation and ongoing maintenance	Best used in conjunction with other management methods e.g. visual deterrents like Foxlights used around lamb corrals / paddocks
Predator-smart livestock farm management	Various options including corralling particularly vulnerable animals (e.g. young or animals giving birth), keeping vulnerable animals closer to homesteads, night corralling, selecting for breeds and individuals that are more protective against predators etc. (Boronyak & Quartermain 2022)	Can require additional time and resources to implement (e.g. staff time, fencing materials, supplement feed)	Costs can involve fencing materials required for additional corralling, additional supplement feeds required if livestock is constrained for long periods and additional staff costs required to manage	Farmers can be reluctant to change/adapt their farm management practices Changing farm management can have implications for grazing management

Management actions	Pros	Cons	Costs	Other considerations and risks
	Can be adapted to the specific context of the farm (e.g. threats, environment, resources available)			
	Can be used short- or long- term depending on the needs			
	Can be effective at reducing livestock predations and therefore can reduce dependence on lethal control			
Lethal methods				
Trapping	Can be used for risk-based pest animal control by placing species-specific traps in particular areas where pest species are a threat Trapping can be conducted for mammalian, bird and amphibian pests (including tadpole trapping for cane toads) Trapping cane toads at the tadpole stage is an effective way of population control (see Watergum website for further information) Species-specific traps can be used with species-specific	Bycatch of native animals is possible with some trap designs. The risk of this can be reduced by strategic placement of traps, avoiding areas of non-target activities e.g. base of trees or where macropod tracks or signs have been found. Pre-control monitoring is advised so that areas of high non-target activity can be avoided. 4G cameras at trap sites can help reduce the time bycatch remains in traps. Animals can become trap- shy, making control efforts more difficult over time Animal welfare concerns can	Costs associated with sourcing traps Costs of trained and licenced trappers is usually more expensive than non-targeted approaches like baiting	Species-specific traps should be used as much as possible to avoid bycatch risk Daily checks are needed on set traps to reduce animal welfare risks

Management actions	Pros	Cons	Costs	Other considerations and risks
	lures to try to avoid bycatch	be avoided by:		
		ensuring adequate cover		
		daily trap checks		
		approaching traps calmly and quietly		
		avoiding periods when dependant young are present		
		using humane traps (e.g. soft padded jaw foot traps)		
		placing traps away from fences to reduce injury risk		
Shooting	Can be used for risk-based pest animal control by conducting shooting in particular areas where pests are causing the biggest threat Can be targeted to individual animals that are causing problems	Can be costly and time- consuming Varying levels of risk associated with using firearms and land use. Shooting should avoid times when dependant young are present or if females are heavily pregnant Inappropriate for using in urban areas due to dangers	Costs of trained and licenced personnel to conduct shooting	Day-shooting may allow for distinguishing between individuals so problem- causing individuals can be targeted. This can also be used if trying to distinguish between dingoes and wild dogs Aerial shooting can be more effective for large pest animals like pigs and deer but is expensive
Baiting (1080, PAPP, Hoggone, FOXOFF)	Different types of baits are currently available and baits can be placed in different materials (e.g. oats to target feral pigs) to minimise non- target bycatch	Regulations must be adhered to for the purchasing, storing, disseminating and disposal Varying bait dosages is thought to target smaller pest	Costs of trained and licenced personnel to conduct the baiting Costs of the baiting purchased at licenced distributors	Potential negative impacts to non-target species can be reduced by: - using species- specific bait types, sizes and dose rates

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Management actions	Pros	Cons	Costs	Other considerations and risks
	Some native species have some tolerance to 1080 baits, reducing risk to native animals, but not all native species have a tolerance that avoids pain, suffering and death. Using doses targeting pest species. 1080 is not a bioaccumulated poison as it naturally breaks down in the environment and does not leave permanent residues in water, soil, plants or animals. PAPP is considered more humane than 1080 baits and it is also not expected to bioaccumulate.	animals (e.g. foxes or cats) and does not kill larger species like dingoes, but there is still a risk of harm and death to dingo puppies Non-target species uptake is most common in varanid lizards (e.g. goannas), marsupial carnivores (e.g. quolls) and some bird species (e.g. crows). Pets can also be affected New technology baiting devices that target specific pests, such as Canid Pest Ejectors and Felixer AI devices still have limitations to their effectiveness and can poison non-target native animals Animal welfare considerations as death is often a long and painful process Baiting rarely targets the specific problem-causing individuals (Mason et al. 2025) Animals can become bait- shy, making control efforts more difficult over time	Costs of signage required to inform of baiting being conducted Costs of monitoring and removing baits (e.g. using cameras or personnel to remove any baits not taken)	 burying baits to reduce visibility and access to non-target species tying baits to stakes to avoid native animals (e.g. birds) taking or moving baits, or foxes caching baits where it may be more likely to be consumed by a native animal using targeted bait delivery devices such as Canid Pest Ejectors, HogHopper™ or Felixers to reduce the risk of baiting non- target native animals or pets Free-feeding with non-toxic baits prior to toxic baits and monitoring for non- target activity

Management actions	Pros	Cons	Costs	Other considerations and risks
Den/warren fumigation	Can kill numerous foxes/rabbits in one treatment If conducted properly, it can cause unconsciousness and death without pain and discomfort using carbon monoxide Targeted to foxes and rabbits with very little risk of non-target bycatch (if fresh fox/rabbit tracks and signs are present at the den / warren)	Animal welfare considerations if not conducted properly Carbon monoxide (used for fox dens), and chloropicrin and aluminium phosphine (used for rabbit warrens) are all toxic to humans, so only trained, experienced and licenced personnel can conduct fumigations of dens and burrows Requires active den / warren locations to be known Carbon monoxide is highly flammable, so extra precautions need to be taken to clear flammable materials from surrounding area and safety equipment (e.g. fire extinguishers) must be on hand	Costs of trained and licenced personnel to conduct the fumigation Costs of all materials and safety equipment required Costs associated with destroying the dens / warrens following fumigation	Best used in combination with trapping and shooting to manage populations Active dens / warrens should be identified by signs of occupation, such as fresh tracks, remains and odour. Old dens/warrens can be occupied by native animals, therefore, dens/warrens without active fox/rabbit signs should not be fumigated Can use detection dogs to help identify fresh dens/warrens Den / warren ripping (destruction) or back-filling is advised following fumigation to reduce the risk of den/warren recolonisation Should only be used for fox dens between August and October when fox kits are older than 4 weeks of age, as young kits can be relatively resistant to hypoxia, and it will take longer for them to asphyxiate, reducing the humaneness of this method

Appendix 8 Pest animal ecology

European red fox

Fox home ranges can vary depending on sex (i.e. males have a larger home range than females), habitat type / landscape (e.g. temperate agricultural, coastal, arid / semi-arid, urban, semi-urban) (Carter et al. 2011), food availability, and fox density (Verbeek & McLeod 2018). In general, home ranges vary up to five km² (Verbeek & McLeod 2018). Similar to wild dogs/dingoes, foxes are primarily active at night, dusk and dawn, and rest during the day (DAF 2020a).

Female foxes breed once a year, with breeding occurring in winter and cubs being born in spring (DAF 2020a; Table 8). Litter sizes typically range between four to 10 cubs (DAF 2020a). Fox densities have been shown to peak in summer (Coman et al. 1991), with cubs emerging from dens in late spring and occasionally as late as October or November. Young foxes disperse from family territory in late summer to early winter (Gentle 2006, DSEWPC 2010). Dens are generally used during early spring to summer and are otherwise vacant (Gentle 2006).

Foxes are a recognised predator to small koalas (Ramsay 1999; DAF 2020b, Mathieson & Smith 2009) and their predation on native wildlife is classified as a key threatening process. Foxes are generally solitary hunters, though can also live in small groups consisting of a breeding pair, cubs, and sometimes subordinate females (DAF 2020a). In urban areas, foxes can generally be found in remnant bushlands or parks and feed on a variety of food types including small birds, small mammals, worms, insects, and fruit (DAF 2020a). Fox breeding, whelping and dispersal can often run later (into October/November; Table 8).

Summer		Autumn			Winter			Spring			
Dec	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov
							Breeding				
								Whelp	oing		
		Dispe	ersal								
											Cubs emerge from dens

 Table 8 Indicative reproductive calendar for red fox (Gentle 2006, DSEWPC 2010).

Feral cat

Feral cats are predominantly nocturnal but are also active at dawn / dusk (Mitchell & Balogh 2007). They are often thought of as solitary animals, though studies show that this is generally only limited to hunting (DAF 2020c). Cats will often live in social groups comprising several related females and an adult male. Their home ranges can vary depending on resource availability (including food and den sites) and sex, with males having a larger home range of up to 10 km² (Mitchell & Balogh 2007). The dominant males' range generally extends across the range of other groups of females (DAF 2020c, Mitchell & Balogh 2007).

Female feral cats generally have two litters per year in spring and late summer / early Autumn, comprised of two to seven kittens. However, the 'breeding season' is less well-

defined than wild dogs/dingoes and foxes as breeding is generally dictated by environmental conditions and resource availability (Mitchell & Balogh 2007). As such, they do not have a particular peak activity season/month and are renowned for being highly elusive and difficult to monitor. Young males raised in their natal group generally disperse or are driven from the group once their reach sexual maturity.

Wild dog/dingo

Wild dogs/dingoes are social animals that often form packs to travel and hunt together and occupy territorial home ranges (DAF 2016a). These home ranges tend to be large, can overlap with other territorial ranges, and are highly dependent on food availability (DAF 2016a). Individual wild dogs/dingoes that are not associated with a pack tend to have even larger ranges and are generally dispersing to find a new territory or to leave their birth group. Wild dogs / dingoes in eastern NSW have been recorded with an average home range of 40 km², though home ranges can vary between 4 km² and 1,000 km² (DPI n.d., Claridge et al. 2009). They preferentially travel along roads and tracks and use these passages for territorial marking (Triggs 1996, Mitchell & Balogh 2007, Raiter et al. 2018). Wild dogs / dingoes are nocturnally and diurnally active but are most active during the night and at dawn and dusk (McNeill et al. 2016, Verbeek & McLeod 2018).

Peak breeding season for wild dogs/dingoes, including the birthing process known as whelping, typically occurs from autumn to winter (DAF 2016; DAF 2016a; Table 9). Wild dogs/dingoes generally breed one to two times a year, rearing an average of five pups per litter (DAF 2016). Females reach sexual maturity at two years of age, while males reach sexual maturity at three years of age (DAF 2016a). Wild dog/dingo activity generally peaks in spring and early summer when wild dogs/dingoes are dispersing after the breeding season (McNeill et al. 2016, DAF 2016; Table 9).

Summer		Autumn		Winter			Spring				
Dec	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov
					Mating						
					Breeding						
					Whelping						
Dispersal											

Table 9 Indicative reproductive calendar for wild dog (Canis familiaris; DAF 2016)

European rabbit

Rabbits are opportunistic breeders and can reproduce at a rapid rate. If resources are available, rabbits can have more than four litters per year and one doe can have up to 60 offspring in one breeding season (O'Keeffe & Walton 2001; DAWE 2011, DPI n.d. [d]).

Rabbits are considered Australia's most expensive pest species, costing the country \$200 million annually in lost agricultural revenue and control programs (DPI n.d. [d]). Nationwide, rabbits and hares have a significant impact on native vegetation and compete with native fauna for food and shelter (DSEWPC 2011). Even at low densities (0.5 rabbits per hectare) they can cause changes in flora species composition and habitat structure through selective grazing and browsing and can impede regeneration efforts (DPI n.d. [d]). During times of drought, they also consume the bark and roots of native species (OEH 2024). Their digging activities damage seedlings and root systems, contributing to soil erosion.

European brown hare

The home range of hares (5-50 ha) is significantly larger than rabbits (1-5 ha) and they can cause significant vegetation damage across a large area as a result (Myers et al. 1989). Hares can breed all year round, although it is usually triggered by the availability of food. In optimal conditions, hares can produce up to four litters of 2-5 young each year, however, the more frequent the litters, the less young are produced.

Indian myna

Indian mynas are 23–26 cm long, weigh 82–143 g, and have a wing-span of 120–142 mm. Males are slightly larger and heavier than females. Their body is brown, with a glossy black head, neck and upper breast. Indian mynas are often confused with the native noisy miner (*Manorina melanocephala*); however, Indian mynas have distinctive dark heads and white patches on their wings that are visible in flight (see Appendix 8). Indian mynas have bright yellow bills, eye skin, legs and feet, and the iris of the adult bird is a reddish brown. Juveniles are duller in colour and have brownish heads.

Indian mynas are found throughout Australia and are concentrated in urban areas, open woodland habitats and habitats fragmented by human activity (Pell & Tidemann 1997). Gregarious, social animals, they form flocks usually between five and 20 individuals, but that can occasionally be as large as 5,000 (Markula & Csurhes 2009). Indian mynas are cavity nesters that will use hollows or crevices in trees or man-made structures including roofs, eaves or any other available space in a building to nest. They form breeding pairs between September to March and find a protected nesting site during this time. While foraging during the day, flocks tend to stay within a one to three km radius of their roosting sites (Tracey et al. 2007). However, in some urban areas with plentiful food supplies they will remain within as little as 200 m of their roosting sites. They are prolific breeders and can raise multiple clutches of 4-6 chicks each year. The fledgling period lasts for 20-30 days and when the juveniles are ready to fly, they travel in small family groups. From Autumn the Mynas join up and move to communal roosts where there can be large numbers of birds. During the day they spread out in small groups to find food.

Indian mynas are sedentary with their highest population numbers occurring between December and March after young leave the nest. Individual birds are adaptive and resourceful and learn about dangers extremely quickly (Brisbane City Council 2020).

Summer		Autumn		Winter			Spring				
Dec	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov
									Mating		
Breeding								В	reedin	Ig	
	Youngs fledgling										
		Di	Dispersal / forming communal roosts								

Table 10 Indicative reproductive calendar for Indian myna (*Acridotheres tristis*; NCLLS 2024)

Cane toad

Cane toads do not have a defined breeding season but prefer the weather conditions that occur with the onset of the wet season (December-February; DPI n.d.[c]). Cane toads are prolific breeders, capable of reproducing from six months of age and producing up to 35,000 offspring up to twice a year. Eggs hatch in two to three days whilst the tadpole stage lasts between four and eight weeks (DPI n.d.[c]). With a life expectancy of five
years, one female can produce 350,000 offspring in their lifetime, however, on average only 700 of these will survive long enough to breed (Cohen 2021).

Cane toads prefer slow-moving or standing water bodies and can occur in high densities (Cohen 2021). They can also be found on land and prefer to be near buildings where there is moisture accumulating (e.g. around leaking taps or under air conditioning outlets), or where bright lights are attracting insects. Cane toad tadpoles tend to congregate together on the surface of submerged rocks or structures close to the banks of waterbodies. Cane toads are incredibly robust and adaptive, making them more resilient to climate change than native amphibians.

Feral pig

Feral pigs occupy roughly 40% of Australia's land mass, across all different habitat types, though they are limited to moist areas where there are adequate water supplies and adequate shelter to protect against extreme temperatures (DAF 2020). The highest densities of feral pigs are found around larger drainage basins and swamp areas (DAF 2020). Female (sows) and juvenile pigs generally persist in small family groups while adult males are typically solitary. Feral pig home ranges can vary between 10 and 50 km² for males and 5 and 20 km² for sows, though if food availability is high this home range can be restricted to within 5 km of an adequate food source (Koichi et al. 2020). Home ranges of sows and piglets can be even more restricted to around 0.16 km² (Koichi et al. 2020).

Similar to feral cats, feral pigs do not have a defined breeding period and can breed throughout the year when conditions are optimal. Breeding tends to peak following rapid growth of green vegetation after heavy rain. Sows make nests of available vegetation within 2 km of a water source. Piglets remain in the nest for one to five days with the sow staying close by (DAF 2020). Piglets are weaned by the age of two to three months, and sexual maturity is reached at around six months of age (DAF 2020).

Feral goat

Home ranges of feral goats are usually dependent on water sources and can reach up to 379 km² (DAF 2020c) during wetter seasons. Female goats can reproduce at six months of age and can have two breeding seasons a year if resources are plentiful. With twin births common, a population of feral goats is able to double in size every 1.6 years if there is no human-induced mortality. To prevent increases in local populations, 35% of the population needs to be removed each year (DAF 2020c).

Feral goats form matriarchal social structures, with females and their offspring forming herds that connect with male bachelor herds only during the breeding season. Breeding occurs in temperate areas between January and June, with a peak in February, whereas there is no definitive breeding season for feral goats living in arid areas (DAF 2020c).

Feral deer

Red deer are one of the larger species of feral deer in Australia, with males 120 cm tall and 135-220 kg and females 90 cm and 95 kg (NSW Government 2019, Deer Scan n.d.(a)). Red deer vary from a reddish colour in summer to a grey brown in winter. They have long, pointed ears, a short tail and mature animals have a pale rump patch. Fawns have distinctive white spots, but these fade after three months of age (NSW Government 2019, Deer Scan n.d.(a)). Antlers are multi-pronged and can reach lengths of 90 cm and are cast in October to November but reform by February (NSW Government 2019). Red deer have a strong herding instinct and live in herds dominated by a single female. Males may live separately to females and juveniles (NSW Government 2019, Deer Scan n.d.(a)). Males become territorial during mating season (April) and have a distinct roar that they use to attract females (Deer Scan n.d.(a)). Although red deer occur in Queensland and Victoria, they only occur in isolated populations in NSW (NSW Government 2019). They prefer sheltered habitats, primarily woodland, rainforest or mixed grasslands, and are only seen in the open if there is thick vegetation nearby (NSW Government 2019, Deer Scan n.d.(a)).

Rusa deer are a medium-sized deer species with reddish-brown coats in summer and dark grey-brown coats in winter (NSW Government 2019). Rusa deer have coarse coats and a mane of long hair around their necks (NSW Government 2019). Males can reach 110 cm and 135 kg and females 95 cm tall and 90 kg (NSW Government 2019). They have large distinctive antlers which consist of three lyre-like tines that can reach 135 cm in length. Males decorate their antlers with grasses and twigs during the mating season to assert dominance over other males (NSW Government 2019). They can be distinguished from other deer species by their oval-shaped scats (Deer Scan n.d.(b)). Rusa deer can form small groups and can breed all year round, usually with fawns born between March and April. They can hybridise with sambar deer and produce fertile offspring. They can also breed with red deer, however only the female offspring of these pairings will be fertile (NSW Government 2019), Deer Scan n.d.(b)). Rusa deer are found in Queensland, South Australia, in isolated populations in Victoria and along the coastal areas of NSW (NSW Government 2019). They prefer woodlands, timbered farmland and grassy open areas flanked by woodland (Deer Scan n.d.(b)).

Fallow deer are the most widespread feral deer species in Australia. They display a variety of coat colours, from red to black, white or spotted and have distinctively flattened antlers that grow up to 50 cm in length (NSW Government 2019). Males cast their antlers in October, and they reform by February (NSW Government 2019, Deer Scan n.d.(c)). Fallow deer can also be distinguished from other deer species by their distinctive Adam's apple and pale rump patch with a black outline (NSW Government 2019, Deer Scan n.d.(c)). Fallow deer have long tails that they flick constantly while feeding and raise when alarmed (NSW Government 2019, Deer Scan n.d.(c)). Scats are stubby pellets and can sometimes have a point at one end (Deer Scan n.d.(c)). For fallow deer, breeding occurs in April to May, with fawns born in December. During rutting season, males produce a distinctive croak, similar to a grunting pig (NSW Government 2019). Outside of mating season, calls can vary from a high-pitched bleating to deep grunts (NSW Government 2019). Fallow deer occur in Queensland, Victoria, Tasmania and NSW, largely in semi-open scrubland and pastures close to cover (NSW Government 2019).

Sambar deer are the largest species of feral deer in Australia, with males reaching 160 cm in height and weighing up to 300 kg and females 115 cm and 230 kg. They have coarse, dark brown coats with lighter colour on their stomachs and under their chins and a mane around their necks (NSW Government 2019, Deer Scan n.d.(d)). Antlers can grow up to 75 cm and have three pines per antler (NSW Government 2019). Sambar deer are largely solitary, and rarely found in herds. Breeding occurs throughout the year, with a peak in September and October (NSW Government 2019). They are semi-nocturnal and prefer to remain hidden throughout the day. They have a distinctive honking / barking alarm call (Deer Scan n.d.(d)). Sambar deer are found in South Australia, Victoria and NSW, favouring closed woodlands, forests and thick-timbered farmlands (NSW Government 2019, Deer Scan n.d.(d)). Their range is spreading across much of NSW and unlike other species of deer, can swim (NSW Government 2019).

Chital deer are a medium-sized deer species, with males reaching 90 cm in height and 85 kg and females 80 cm and 60 kg (NSW Government 2019). Visually distinct from other deer species by the striking white patches on their throat, white spots on their reddish to chestnut coat, the dark dorsal stripe and dark band over their muzzle and their long tails

(NSW Government 2019, Deer Scan n.d.(e)). Antlers can reach 89 cm in length and are smooth and slender, with three tines on each antler (NSW Government 2019). Highly gregarious, Chital deer can form large herds up to 100 individuals (NSW Government 2019, Deer Scan n.d.(e)). Chital deer breed all year round and can produce three fawns every two years (NSW Government 2019). Females will separate from the herd when birthing and rearing their young (NSW Government 2019). Chital deer have a distinctive high-pitched alarm call (NSW Government 2019). Scats are small and cylindrical, sometimes with an indentation at one end (Deer Scan n.d.(e). Chital deer are found in small, isolated populations in South Australia, Victoria, Queensland and NSW and are rarely found in proximity to people (NSW Government 2019, Deer Scan n.d.(e)).

Appendix 9 Identifying pest animals

Indian myna and noisy miners

Indian mynas are often confused with the native noisy miner; however, Indian mynas have distinctive dark heads and white patches on their wings that are visible in flight. Indian mynas have bright yellow bills, eye skin, legs and feet, and the iris of the adult bird is a reddish brown. Juveniles are duller in colour and have brownish heads.



Figure 22 Physical differences between Indian mynas and noisy miners. (Source: Goulburn Murray Landcare Network 2019)

Cane toads



Common eastern froglet *Crinia signifera* – extremely variable in appearance; small, up to 3 cm in length.



Tusked frog Adelotus brevis – a medium-sized species up to 5 cm in length; mottled belly similar to cane toad.



Great barred frog Mixophyes fasciolatus — a large species of frog reaching up to 10 cm in length.





The bleating tree frog *Litoria dentata* — a medium-sized species reaching up to 4.5 cm in body length.



Spotted marsh frog *Limnodynastes* tasmaniensis — a medium-sized species reaching almost 5 cm in length.





Peron's tree frog (*Litoria peronii*) — a large species reaching up to 7 cm in length.



Striped marsh frog *Limnodynastes peronii* — a large species reaching up to 7.5 cm in body length.

Scarlet-sided pobblebonk *Limnodynastes terraereginae*, sometimes called the northern banjo frog — a large species reaching up to nearly 8 cm in length.

Figure 23 Native species often mistaken for cane toads. (Source: Cohen 2021)



Figure 24 Distinguishing features of a cane toad. (Source: Office of Environment and

Heritage 2023) Rabbits and hares



Figure 25 Hares (left) and rabbits (right) are subtly different. Hares are larger with longer ears and legs. Rabbits also show the white underside of their tail when running.

Alert species

Alert species should be reported to the Invasive Plants and Animals Enquiry Line, telephone: 1800 680 244.

Red-eared slider turtle

The red-eared slider turtle originates from the USA and Mexico. This species has a distinctive red or orange stripe behind the eyes and a carapace length for an adult of 12.5 to 28 cm (DPI n.d (b)).



Figure 26 Red-eared slider turtle (left and right)

American corn snake

The American corn snake originates from the southern USA and Mexico and pets released into the wild in Australia has led to a feral population. Corn snakes predate and out-compete native species. Restrictions apply to their importation, possession and sale. Highly variable in colour, most adults are red in colour with orange patches edged in black on a grey or orange background, however, albino animals show more orange colouration (Figure 28). Adults are between 1-1.5m long.





Red imported fire ant

Red imported fire ants are native to South America and are 2-6 mm in length with a coppery-brown head and body with a darker abdomen. Nests are dome-shaped (up to 40 cm high) and do not have a clear entrance hole (DAF 2023).



Figure 28 Red imported fire ants (left and right)

Yellow crazy ant

Yellow crazy ant is recognised by their pale-yellow body colour, unusually long legs and antennae. The name 'crazy ant' is derived from their frantic movements and frequent changes in direction, especially when disturbed. The abdomen is dark brown with length of body typically around 5 mm. Yellow crazy ants form super colonies with several queens and once a super colony is established, it can expand rapidly, in some cases doubling in size in 12 months (DPI 2018).



Figure 29 Yellow crazy ant

Indian ring-necked parrot

The exotic Indian ring-necked parrot is long-tailed, usually grass-green in colour with a red beak. The males have a narrow pink and black collar which is lacking in immature and female birds (DPIRD 2018a).



Figure 30 Indian ring-necked parrot (left and right)

Red deer



Figure 31 Red deer male (left) and female (right)

Rusa deer



Figure 32 Rusa deer male (left) and female (right)

Fallow deer



Figure 33 Fallow deer male (left) and female (right)

Sambar deer



Figure 34 Sambar deer male (left) and female (right)

Chital deer



Figure 35 Chital deer male (left) and female (right)

Appendix 10 Potential funding sources

 Table 11 Potential funding sources for pest animal management

Commonwealth	
Commonwealth Government	For more information about grants provided by the Commonwealth Government, see https://www.agriculture.gov.au/biosecurity- trade/pests-diseases-weeds/pest-animals-and-weeds/supporting- communities#onground-management-and-control-activities-focused- on-threatened-species-strategy-20212031-action-plan-priority- species-and-places.
On-ground Management and Control Activities: Matched Funding Opportunity with State and Territory Governments	In March 2022, the then Minister for Environment approved \$20 million for 30 State and Territory-led projects for on-ground management of established pest species to reduce impact on agricultural production, native wildlife, the environment and communities. This funding leverages \$45 million from State and Territory governments. Projects will include activities such as coordinated control and removal, trapping, baiting and biological control release.
	The Australian Government has offered a total of \$3,480,000 of funding for the following projects across NSW through the Department of Primary Industries (2021-2022 to 2024-2025):
	 better predator control (wild dogs/dingoes, foxes, feral cats and feral pigs)-to enable more effective suppression of wild dogs/dingoes, foxes and feral cats in highly productive areas (e.g. tablelands and escarpments)
	 reducing feral deer and pig impacts in NSW hotspots (north- west and central regions of NSW only)
	 releasing weed biocontrol agents.
On-ground Management and Control Activities: Focused on Threatened Species Strategy (2012- 2031) Action Plan Priority Species and Places	\$6 million in funding has been allocated to regional natural resource management organisations to deliver on-ground pest animal and weed reduction activities that will protect threatened species and ecological communities. Projects will focus on priority species and areas identified in the Threatened Species Strategy (2021-2031) and its five-year action plan. These funds may be available through NCLLS and could provide additional funding for on-ground pest management activities.
Better Information: Improved Information and Data on Established Pests and Weeds	The Australian Bureau of Agricultural and Resource Economics and Science (ABARES) has been provided \$2.2 million for projects that improve our understanding of the distribution, abundance and impacts of priority established pest animals and weeds. It is unclear whether this funding could be accessed by local governments, but if so, it could be utilised for strategic actions focused on the improvement of pest data collection and reporting.
Centre for Invasive Species Solutions	A national collaborative research, development and extension organization that brings together government, industry and research partners to create a coordinated, collaborative and innovative set of research and extension projects. There may be opportunities to collaborate with the Centre on more

	research-based projects in the Shire.			
Australian Research Council	The Australian Research Council is a Commonwealth entity within the Australian Government that provides funding for research activities that improve knowledge for the benefit of the Australian community. The Research Council supports applied research and research training activities through the National Competitive Grants Program. Grants are available to individuals, research teams and large-scale centres through the Discovery Program (for individuals and small teams) and the Linkage Program (for links between universities, industry and other partners). Grants available through the Australian Research Council could be utilised for research-based work relating to Council's pest management activities, including testing innovative solutions to pest species management.			
State and regional				
Environmental Trust	The NSW Environmental Trust provides funding for a range of community, government and industry stakeholders to deliver projects that conserve, protect and rehabilitate the environment, or that promote environmental education and sustainability. The Trust provides this funding through a range of grant programs, including long-standing annual programs and one-off, issue-specific programs. Funding in the following areas relating to pest animals include:			
	protecting threatened species			
	undertaking priority environmental research			
	Duilding community skills			
	Knowledge and capacity through education			
	 promoting cultural awareness. Ongoing Environmental Trust programs that could be utilised for Council's pest management activities include: 			
	 Environmental Education-supports projects that develop knowledge, skills, and commitment to sustainable behaviour, and ongoing participation in protecting the environment. Local government, not-for-profit organisations and community groups are eligible for these grants. Tier 1 grants up to \$60,000, and tier 2 grants up to \$250,000. Next round will open in 2025 with a closing date still to be announced. 			
	 Environmental research-supports applied research for local environmental problems. Research institutions and collaborations with local governments are eligible for these grants. Grants are up to \$200,000 per project. The next round will open in 2025 with the closing date still to be announced. 			
	 Protecting our Places-Funds protection and rehabilitation for culturally important land and water. These funds are only available to NSW Aboriginal community organisations and groups; however, this could be used by local First Nations groups within the Shire in coordination with Council's pest management activities. Grants up to \$80,000 per project are available over two stages. The next round opens in 2025, with the closing date still to be announced. 			

	For more information, visit https://www.environment.nsw.gov.au/funding-and-support/nsw- environmental-trust/grants-available.
North Coast Local Land Services	LLS assist public and private land managers to ensure best practice land management of natural resources, including pest control. LLS provide guidelines, training and incentive programs and can assist Councils with pest management plans across the North Coast region. NCLLS delivers grants and funding programs to support the community to conduct natural resource management and for sustainable agriculture activities.
	Government LLS "Grants and Opportunities" website and are advertised through the North Coast Local e-newsletter. Funding opportunities, including tenders, will be listed on the following website when available: https://www.lls.nsw.gov.au/regions/north- coast/financial-assistance.
Department of Primary Industries Vertebrate Pest Research Unit	The Vertebrate Pest Research Unit is currently conducting a landscape-scale research and management project on wild dogs/dingoes, foxes and feral cats in northeastern NSW. The Unit specialises in a range of field trials including improve integrated management strategies for wild dogs/dingoes, foxes, feral cats and deer, rabbit biocontrol, quantifying non-target impacts of pest management, social psychology considerations regarding the management of pest animals, and the development of best practice control methods for pest animals including animal welfare considerations. Council and private land managers should consider participating in this research program to better understand how predators interact with the landscape and to reduce the impacts of pest animals. It is understood that the program is well funded and extends over a long

Appendix 11 Pest research findings

Recent research can help inform pest management approaches taken by Council in managing the biosecurity risks of pests and relevant local research opportunities to improve the efficiency of Council's pest management approach.

Free-roaming cat ecology research study

A study was conducted in several NSW Local Government Areas (LGAs), including Byron Shire, using transects and camera trapping aimed at identifying abundance and behaviours of free-roaming cats (Kennedy 2023). Transects revealed a density estimate of free-roaming cats of 0.066 cats per hectare, with an estimated abundance of 187 free-roaming cats for the LGA. These estimates are likely to be an underrepresentation of the real figures, as transects were conducted between 2:30-5:30 pm, which camera trapping revealed to be a period of the least activity for cats in Byron Shire. Camera trapping revealed cats in Byron Shire to be more nocturnal than those at the other sites (Tweed Shire, Campbeltown and the Blue Mountains), with peak activity between 7-8 pm. Camera traps detected foxes more frequently in rural areas than residential areas (Table 11). A large number of domestic dogs, and free-roaming cats were also detected, particularly in residential areas. The results did not distinguish between feral cats and free-roaming domestic cats (pets), though their impacts on native wildlife are similar.

Table 12 Free-roaming pets and pest species captured on camera traps in Byron Shire over	эr
2,508 trap nights (Data source: Kennedy 2023)	

Location	Domestic dogs	Wild dogs / dingoes	Cats	Fox
Residential areas-Byron Shire	1011	0	280	35
Rural areas-Byron Shire	386	6	0	111
Byron Shire (total)	1397	6	280	146

Non-lethal pest management research

Recently published research on livestock guarding dogs in Australia have shown that they can be an effective tool at reducing livestock losses to pest species in the long term (van Bommel & Johnson 2023). Over a hundred livestock guarding dog owners were contacted nine years following their involvement in a previous study on guarding dog effectiveness. This research discovered that over half of the original participants were still using livestock guarding dogs. The study also found that the effectiveness of these dogs meant that this method reduced reliance on lethal control measures, providing economic relief for participants. The main disadvantages reported were commitment required to look after the dog (40%) and the commitment required for training, and difficulties that can arise with training (24%).

The University of NSW (UNSW) developed the Myall Lakes Dingo Management Project in 2019 after public outcry after a targeted dingo cull in 2019. The project aims to understand dingoes in the area, test non-lethal management tools and develop a coexistence framework for the area (between Port Macquarie and Newcastle). The project was co-designed with numerous stakeholders and partners and is co-led by UNSW along with the two local land councils and Indigenous ranger groups. The project focuses on evidence-based, individual-focused management of dingoes with strong partnerships and community involvement. The

project first sought to identify the density estimates of dingoes in the area, including the DNA purity of dingoes in various locations and develop an understanding of their behaviour and ecology. Using that knowledge and a thorough understanding of the conflicts in the area, they have been able to develop non-lethal management tools and approaches, including localised inclusion fencing, awareness-raising and reducing high risk activities to reduce the risks of negative impacts. Results so far have been encouraging, and since the inception of the project, only five dingoes have had to be euthanised due to negative interactions (Jordan 2024).

On K'gari island (formally known as Fraser Island) the pure dingo population have been formally managed since the death of a boy in 2001. The Butchulla people are the Traditional Owners of K'gari and have been involved with dingo management on the island since 2014. Problems to management include increased number of visitors, people feeding dingoes (intentionally and unintentionally with waste) and misinformation (people thinking they are not dangerous or people thinking they should be sent to zoos). Non-lethal dingo management, including exclusion fencing in high-risk areas, awareness-raising and research is being conducted with an emphasis on evidence-based reduction in risk and lethal response only to extreme negative interactions (Behrendorff 2024).

The Minyumai Rangers work on a non-lethal dingo management and research in the Minyumai Indigenous Protected Area (IPA) in Gumbaynggirr Country (south of Bundjalung Country where Byron sits). Preliminary data, yet to be published, conducted using camera traps, DNA studies and diet analysis has improved knowledge of the dingoes in this area to inform non-lethal management. Results have shown a high purity of dingoes in the area, and a diet made up of pest animals (feral pigs), and native animals (swamp wallabies and snakes) rather than livestock. They are also working with various stakeholders to conduct camera studies in the Bundjalung National Park.

Recent research by the University of Sydney shows that olfactory cues can help distract pest animals to protect native animals and crops (Ittimani 2024). By widely distributing artificial odours pretending to be the asset at risk (whether plant or animal), this olfactory misinformation can disorientate pest species so that they stop looking for their target. Researchers are continuing to test this approach on a variety of species, including foxes in Finland, threatened birds in New Zealand and mouse plagues in regional Australia, and if found successful, could be a useful non-lethal tool for the management of pest animals in the Shire.

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	27/09/2024	Pest Animal Management Plan 2025- 2030 DRAFT	Jane Horgan, Wildlife Biologist Kurt Lane, Ecologist	Kurt Lane, Ecologist Jess Bracks, General Manager Wildlife Services	Heather Richards, Senior Environmental Scientist
R1	20/12/2024	Pest Animal Management Plan 2025- 2030 R1	Jane Horgan, Wildlife Biologist Kurt Lane, Ecologist	Jess Bracks, General Manager Wildlife Services	
R2	14/01/2025	Pest Animal Management Plan 2025- 2030 R2	Jane Horgan, Wildlife Biologist	Kurt Lane, Ecc	logist

Distribution List

Copy #	Date	Туре	Issued to	Name
5	14/01/2025	Electronic	Byron Shire Council	Claudia Caliari
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